

**An examination of the variables that influence  
the supply of Eucalyptus pulpwood timber to  
NCT strategic markets in KwaZulu-Natal.**

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**Submitted in partial fulfilment of the requirements for the degree of  
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at the University of KwaZulu-Natal  
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## **Executive Summary**

In recent times a need has developed within NCT for a more accurate prediction of pulpwood available from its members for supply to strategic markets. Present systems indicate the volume of timber per member per farm, however this volume has been found not to be an accurate prediction of what will actually reach the mill at the end of the day as many factors come into play and influence the volume that reaches the mill. The questions arise: which factors influence the availability of marketable Eucalyptus pulpwood timber, and to what extent do the different factors play a role? It was with this problem in mind that a comprehensive survey was undertaken to evaluate a number of factors identified and to try and determine their impact on the volume of Eucalyptus pulpwood supplied.

From the research, it is evident that the Greytown district suppliers are, in comparison to the other districts, the least affected by the statements in the survey. In the event that supplies are reduced it is mainly as a result of operational problems. Greytown members will seldom bank or sell their timber to competitors, however when it does happen, they are just as likely to sell to the competition as they are to bank their timber. Members in this district are relatively price insensitive. The district most similar to that of Greytown is the Zululand district.

The Zululand district suppliers are the second least affected by the statements in the survey. In the event that supplies are reduced it is mainly as a result of operational problems. Zululand members will seldom bank their timber, however they will sell timber to competitors, however, this is less likely to happen in Zululand than in Northern and Southern Natal. This is the only district that strongly indicated that in the event of very low prices they would rather sell timber to the competition than bank it. The other three districts all rated banking and / or selling to the competition fairly equally. Generally however, the Zululand members are relatively price insensitive. This district is most similar to the Greytown district.

The Northern Natal district suppliers are the most affected by the statements in the survey. Supplies are mainly reduced as a result of members banking their timber by reducing their harvesting. Price competition also has an impact on volume reduction in this district. In contrast to the aforementioned districts, members in this district are relatively price sensitive.

Some operational challenges exist here, however not as severely as in Zululand and Greytown districts. This district is most similar to the Southern Natal district.

The Southern Natal district suppliers are second most affected by the statements in the survey. Supplies are mainly reduced as a result of members reducing volumes when NCT prices are lower than that of the competitors. It must be noted however that banking of timber by reducing volumes that are harvested as well as operational issues also have a noticeable impact. In fact in this district all three the issues, namely banking, competition and operational issues, impact almost in equal measure on supply volumes. This district therefore faces a higher variety of challenges all round. Members in this district are relatively price sensitive. This district is most similar to the Northern Natal district in term of sensitivity to price, and also shares similarities with the Greytown and Zululand districts with regards to the operational issues that it faces.

Actions suggested in order to address the impact of the various issues as found in the study include:

- Investigations into backwards vertical integration to alleviate the labour, contractor and transport problems faced by members.
- The education of members in terms of the possible synergies and efficiencies that can exist between different crops.
- Encouraging members who have planting permits and suitable areas to plant timber.
- Designing and implementing a programme that identifies, analyses and addresses any inefficiency in the NCT system therefore allowing a bigger margin before a price reduction has to be implemented and/or at the same time increasing the members' profit margin making them less price sensitive.
- Designing and implementing a loyalty reward programme using the power of the overall size of the co-operative's membership to optimise benefits to individuals.
- Offering a value added service to members by knowing and understanding what members want, value and expect from the co-operative.

Further to this the first point of focus needs to be the most sensitive district namely Northern Natal, which is also the biggest district in the north. Once issues here have been addressed

sufficiently, the focus can be shifted to the next most sensitive district namely the Southern Natal District, followed by the Zululand District and lastly the Greytown District.

The co-operative must continue providing members with non-pulpwood market options even though supplies to these markets erode pulp volumes. By remaining involved here it can maintain member loyalty, high levels of interaction with its members and good member relations.

The payment of commitment bonuses to members, as and when is possible, remains an attractive advantage of supplying timber through the co-operative. The reliable service offered to members and the current systems and procedures that are used further enhances the co-operative in the eyes of its members. It is recommended that member surveys continue in order to monitor the satisfaction with NCT related issues and in order for the co-operative to pick up any possible concerns from the membership base.

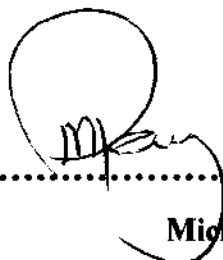
The co-operative must strive towards continually improving in all areas and towards alleviating any constraints found in its supply chain or systems.



## **Declaration**

I, Michelle Perry, hereby declare that:

- The work in this research report is my own original work;
- All sources used or referred to have been documented and recognised and;
- This paper has not been previously submitted in partial or full fulfilment of the requirements for an equivalent or higher qualification at any other recognised education institution.



.....

**Michelle Perry**  
**15 May 2006**

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The completion of this study would not have been possible without the support, guidance and love of many others. I would like to thank and honour them through this acknowledgement:

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## **List of Abbreviations Used**

ASP	Annual Supply Potential
CO-OP	Co-operative
CTC	Central Timber Co-operative
FSC	Forestry Stewardship Council
FSA	Forestry South Africa
GIS	Geographic Information System
ICA	International Co-operative Alliance
ICFR	Institute for Commercial Forestry Research
IPB	Integrated Poultry Business
MAI	Mean Annual Increment
NCT	NCT Forestry Co-operative Limited
SAFCOL	South African Forestry Company Limited
TOC	Theory of Constraints
TWK	TWK Agriculture Limited
UCL	Union Co-operative Limited



## **Chapter 1**

### **Introduction and Structure of the Report**

#### **1.1. Introduction**

With the recent developments surrounding the liquidation of Stockowners Co-operative, a co-operative governed by the same principles as NCT, who liquidated when it could not repay its loans to the Landbank, and the investigation by NCT Forestry Co-operative (NCT) into expanding its marketing opportunities, a need has materialised for a model that provides NCT with a prediction of Eucalyptus pulpwood timber (commonly known as gum) available for supply to NCT strategic markets in Richards Bay and Durban.

NCT is recognised as an international supplier of quality roundwood timber and is the largest forestry-marketing organisation in southern Africa. NCT was established in 1949 as a marketing co-operative to cater to the needs of private and independent timber growers. As a co-operative, its members who share in profits, own NCT. Today membership stands at approximately 2000 shareholding members, representing a total area of approximately 296 000 ha or 21% of afforested land in South Africa (NCT<sub>2</sub>, 2005, paragraph 3).

NCT's role is to act as agent for both members and processors; the best market prices are negotiated on behalf of its members and stable supplies of quality round wood timber are secured for local and export markets. Members not only benefit from the wide range of services NCT offers, but also share in its annual profits and qualify for bonuses based on their patronage and committed supply, obviously depending on available cash.

The current NCT order allocation policy is used to determine monthly timber allocations per member per market, based on a set of equitable rules. Within this policy the following member categories are specified:

- Category 1 - A shareholder; timber grower on owned or leased land, committed.\*
- Category 2 - A shareholder, harvesting contractor, committed.
- Category 3 - A shareholder; timber grower with non-sustainable areas (i.e. 50 hectares or less per genus) on owned or leased land, committed.
- Category 4 - A Shareholder, timber grower, not committed.
  
- Category 5 - Not a shareholder, historically disadvantaged Small Scale Timber Growers.
- Category 6 - Shareholder, not a timber grower, not committed.
- Category 7 - Not a shareholder, not previously disadvantaged, corporate or Ad Hoc supplier
- Category 8 - Shareholder timber grower or harvesting contractor in holding period.\*\*
- Category 9 - All suppliers who don't qualify for any of the above 8 Categories.

\*A committed member has signed a commitment agreement committing some or all of his timber for supply through the co-op over a designated period of time.

\*\* From time to time shares are only issued after a twelve month probation period.

In contrast to other commercial timber producers, NCT does not own its timber resource. The resource is owned by the private timber growers in the country who have elected to become members of NCT. This creates pressure on NCT in terms of meeting market requirements. Traditional commercial suppliers, like Sappi and Mondi on the other hand have more control over their resource as they own their plantations; subsequently they also control the harvesting and therefore the availability of timber for supply. On the other hand, NCT can calculate the technical availability of timber from its members but do not control the harvesting of the timber. The result is that what is technically available as a resource does not always materialise in practise. The aim of this study is to identify and understand the variables that affect the supply of timber from members and by building the weighted variables into a supply model we hope to attain a more realistic picture of available timber.

As mentioned before, present systems calculate what is theoretically available, but do not take into account the many variables that influence what is practically available.

In terms of the technical availability of timber, the NCT Forester Geographic Information System (GIS) is used to verify all relevant information, used in calculating the annual supply potential (ASP) in tons that can be felled each year for eucalyptus, pine and wattle. This research will be focussing on the supply of eucalyptus only as firstly, the bulk of NCT's sales volume consists of eucalyptus and secondly as the availability of wattle remains fairly static due to the fact that wattle is felled as required for an annual bark quota which rarely varies from year to year.

The detailed research objectives are as follows:

- To identify the variables that impact on the supply of eucalyptus pulpwood timber.
- To quantify the impact of the main variables on supplies.
- To weight the identified variables according to the significance of their impact on supplies.
- To identify any similarities between the four districts with regards to issues affecting supply.
- To identify differences between the four districts with regards to issues affecting supply.

## **1.2. Structure of the Research Report**

The following chapters have been included in the research report:

Chapter 1: Introduction and Structure of the Report.

Chapter 2: The Forestry Industry: An international and local overview, including the definition of a co-operative, the pros and cons of a co-operative in the forestry industry, factors affecting the supply of timber in SA and abroad, the current method used to calculate a theoretical availability of Eucalyptus pulpwood for supply, the ASP calculation method for Eucalyptus for timber growers with sustainable areas (100 ha or more) and a disparity between theoretical and actual supply volume.

- Chapter 3: The Theory of Constraints, a brief overview of this theory and how it can be used to address the research problem.
- Chapter 4: Research Methodology, statement of the problem, research objectives, research design/strategy, questionnaire design, sample design, data collection, data analysis, research limitations.
- Chapter 5: Findings, the sample profile, results from the Greytown District, discussion of Greytown District results, results from the Northern Natal District, discussion of Northern Natal District results, results from the Southern Natal District, discussion of Southern Natal District results, results from the Zululand District, discussion of Zululand District results, combined results across all Districts, discussion of results across all Districts.
- Chapter 6: Conclusions regarding the Greytown District, Northern Natal District, Southern Natal District, and Zululand District, the weighted variables that impact on the supply of eucalyptus pulpwood timber, quantification the impact of the main variables on supplies.
- Chapter 7: Recommendations to NCT Forestry Co-operative Ltd in general, Greytown specific recommendations, Northern Natal specific recommendations, Southern Natal specific recommendations, Zululand specific recommendations.

This concludes the introduction and structure of the report and leads to chapter two where a theoretical framework is introduced.

## **Chapter 2**

### **The Forestry Industry: A local overview**

#### **2.1 Introduction**

In this chapter we will briefly look at the Forestry Industry within the South African context. The information in this chapter provides a backdrop to enable the reader to better understand NCT Forestry Co-operative's position in the industry as well as looking at the pros and cons of a co-operative structure in the industry. This chapter also looks at factors affecting supply of timber, locally and abroad as identified in other research. The latter part of the chapter looks at the current method used by NCT to calculate the theoretical availability of timber for supply as pulpwood as well as any disparity between the theoretical volume available and the actual volume supplied.

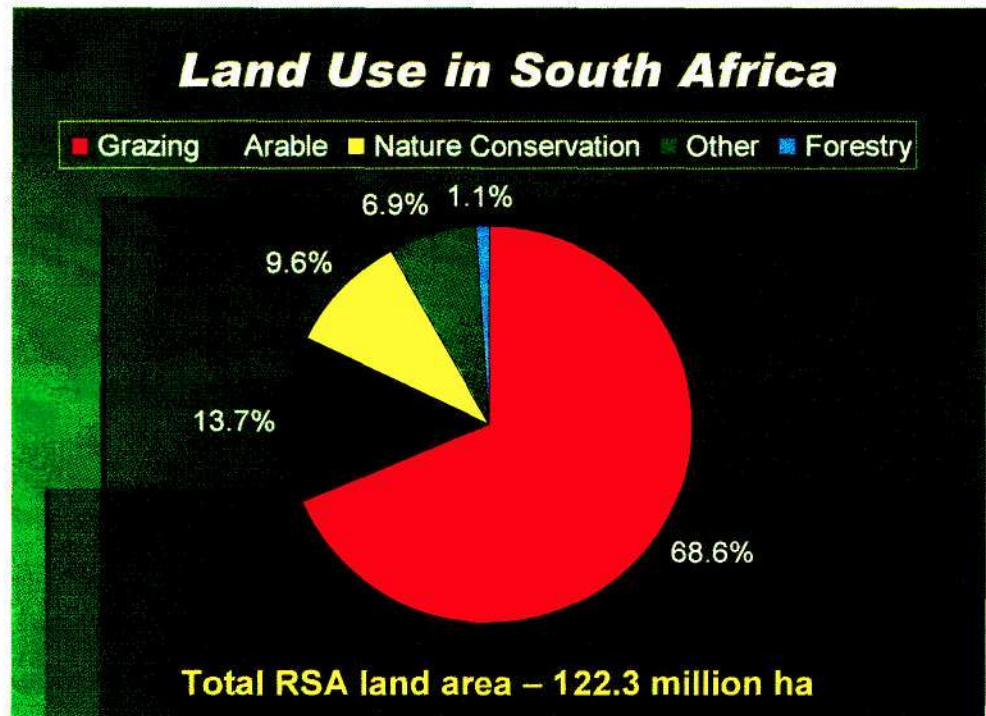
#### **2.2 The Forestry Industry in South Africa**

In order to obtain an overview of the industry the relevant information has been selected and is presented in graphical format for easy reference. The information and graphs are courtesy of Forestry South Africa's Roger Godsmark (2005).

Forestry South Africa (FSA) is an association representing the interests of commercial timber growers in South Africa. The association has over 90% of all registered timber growers as members, equating to over 2500 members. (Forestry South Africa, 2005, paragraph 2).

**Diagram 2.1: Land Use in South Africa**

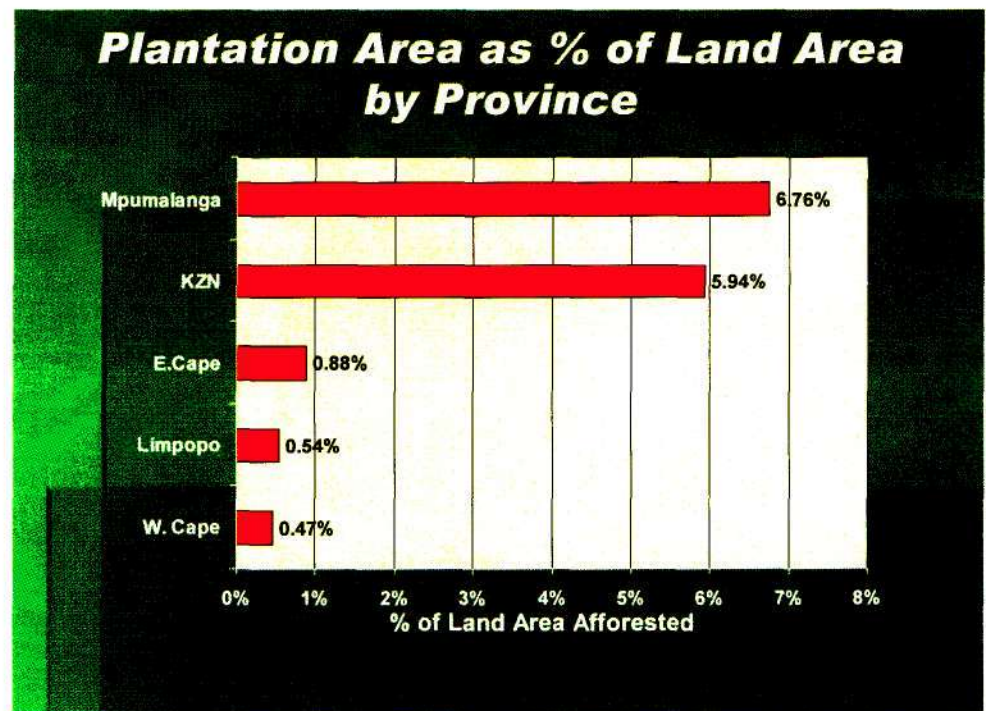
As can be seen from the graph on the right Forestry makes up a mere 1.1% of land use in South Africa, with the majority of land being used for grazing.



(Godsmark, 2004)

**Diagram 2.2: Plantation Area by Province**

This graph indicates where the majority of plantation area is found in South Africa. Mpumalanga leads the way with 6.76% closely followed by KZN with 5.94%. These two provinces form the hub of the industry.

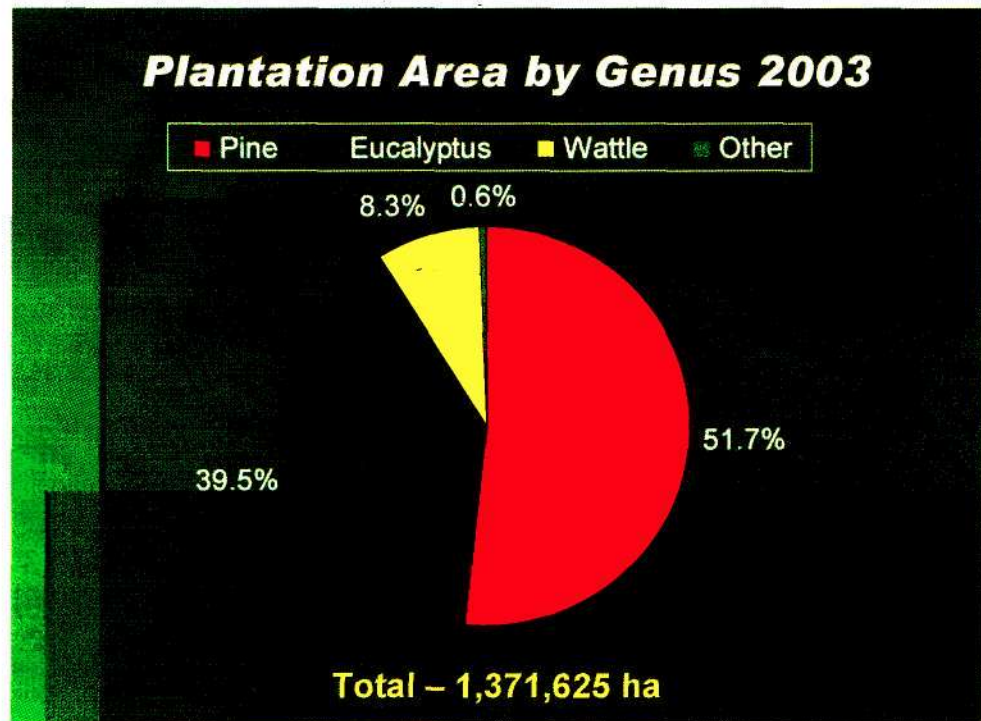


(Godsmark, 2004)



**Diagram 2.3: Plantation Area by Genus**

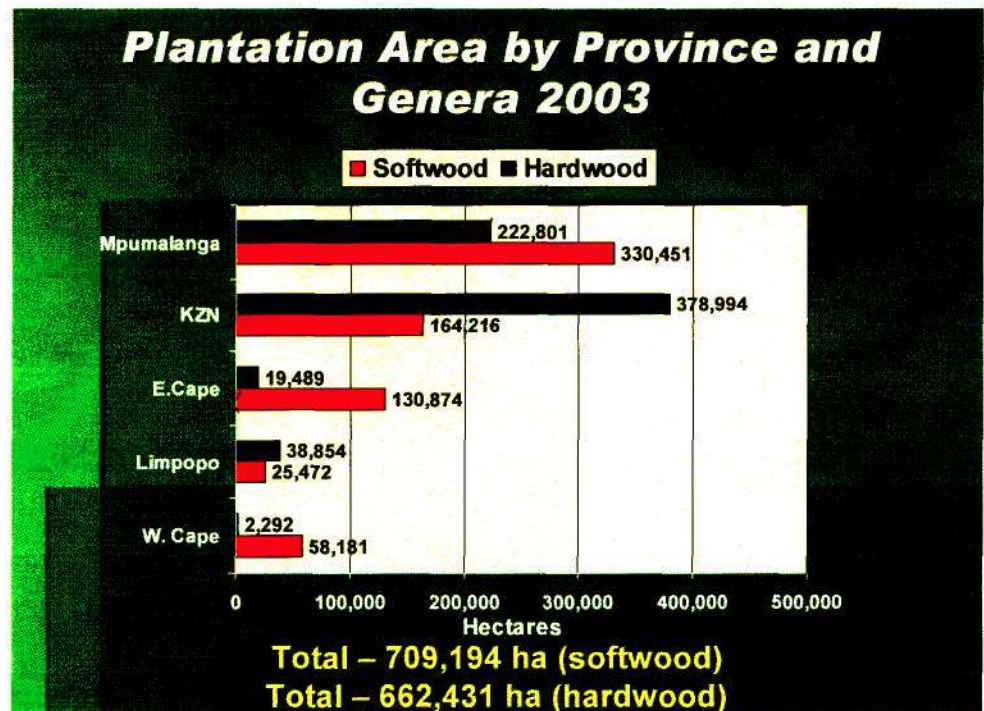
Diagram 2.3 shows that roughly half of the area under plantation is planted to pine (softwood) and the remaining half to Eucalyptus and Wattle (hardwood). Eucalyptus makes up 39.5% of the area compared to a mere 8.3% wattle, further supporting the focus of this study on Eucalyptus.



(Godsmark, 2004)

**Diagram 2.4: Plantation Area by Genera by Province**

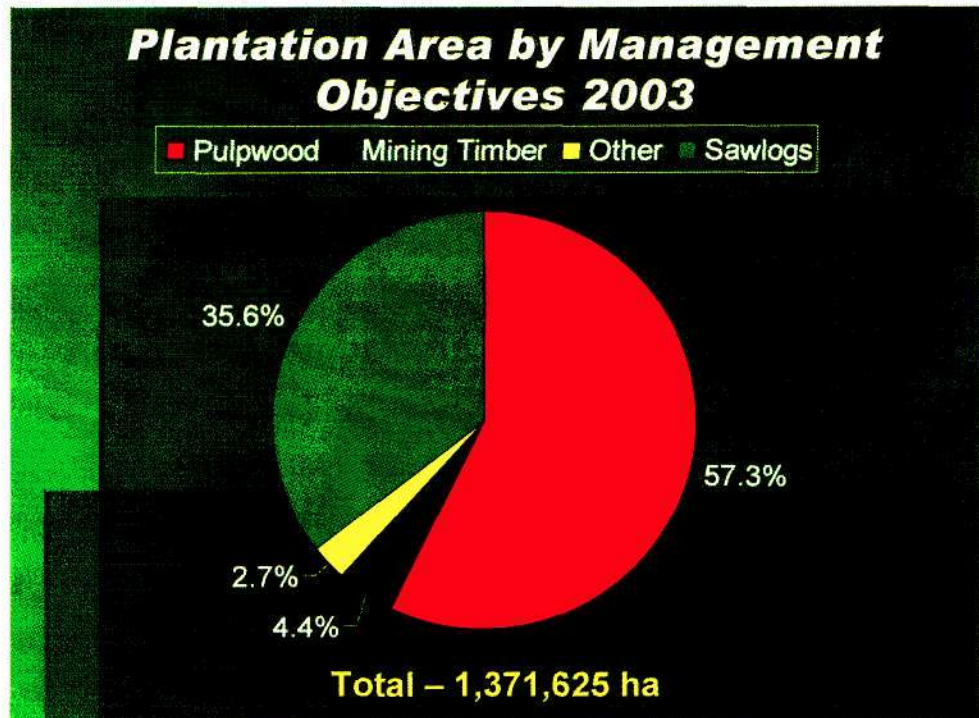
As can be seen from diagram 2.4 the majority of plantations in KZN, where this study took place, consist of hardwoods. Hence the focus on this area and again on Eucalyptus.



(Godsmark, 2004)

**Diagram 2.5: Plantation Area by Management Objectives**

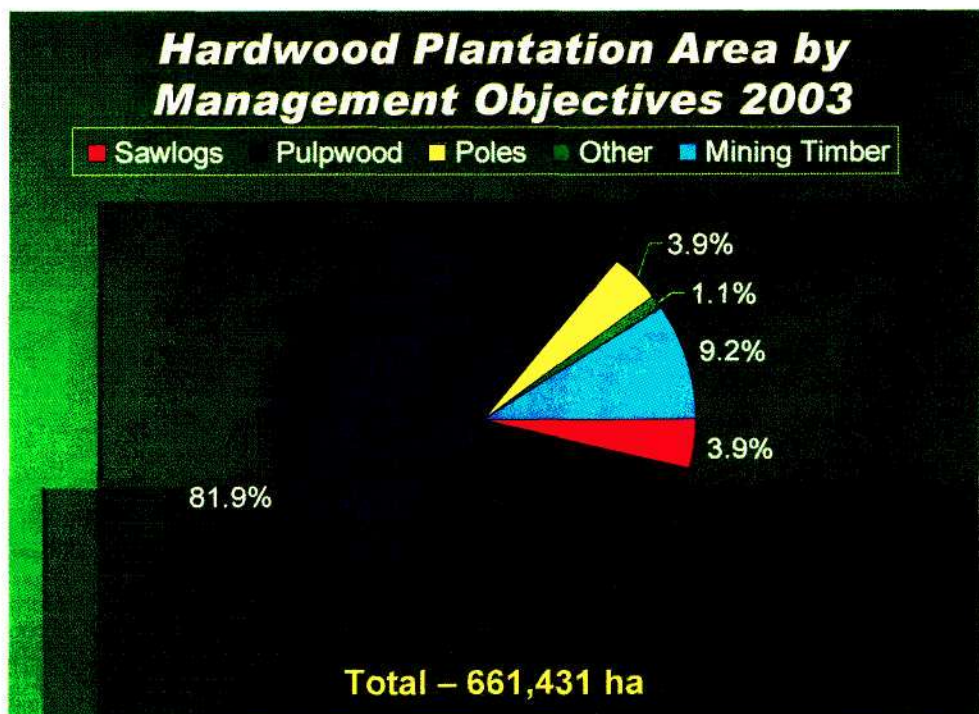
The importance of the pulpwood industry is clear from this graph. 57.3% of plantations are grown with pulpwood as the objective. With the second biggest objective being sawlogs which comprises mainly of softwoods.



(Godsmark, 2004)

**Diagram 2.6: Hardwood Plantation Area by Management Objectives**

When looking at hardwoods only the role of pulpwood in the industry becomes even more significant with 81.9% of hardwoods grown for pulpwood purposes.

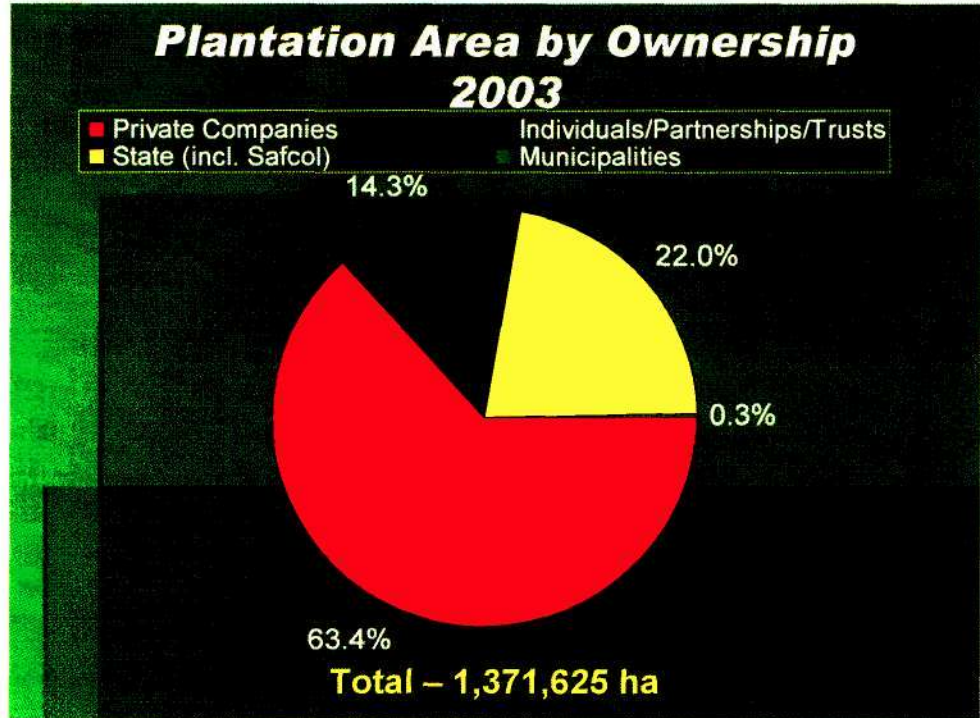


(Godsmark, 2004)



**Diagram 2.7: Plantation Area by Ownership**

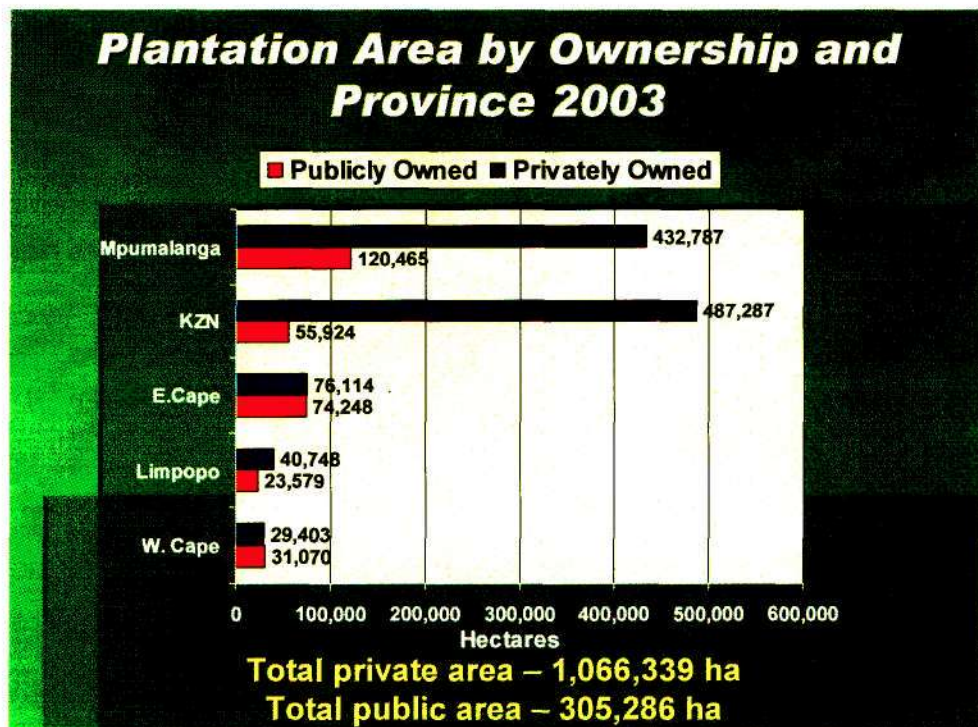
63.4% of plantations are owned by private companies such as Mondi and Sappi. NCT's membership base comprises of private timber growers from the 14.3 % privately owned timber areas and a number of municipalities.



(Godsmark, 2004)

**Diagram 2.8: Plantation Area by Ownership and Province**

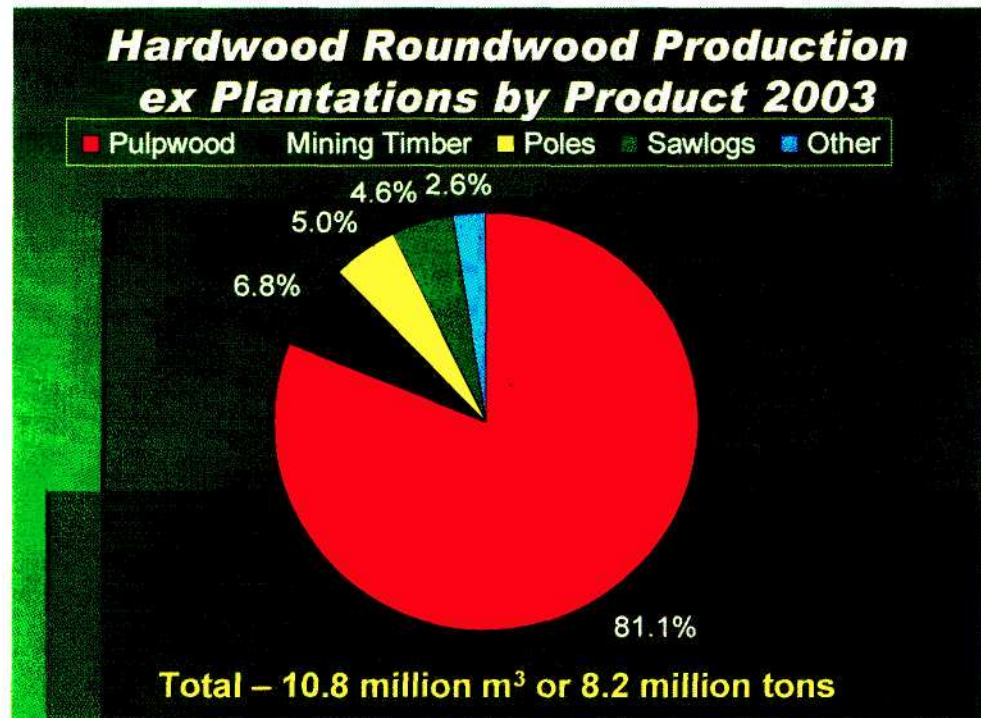
This diagram shows the majority of privately owned timber to be found in KZN



(Godsmark, 2004)

**Diagram 2.9: Hardwood Roundwood Production by Product**

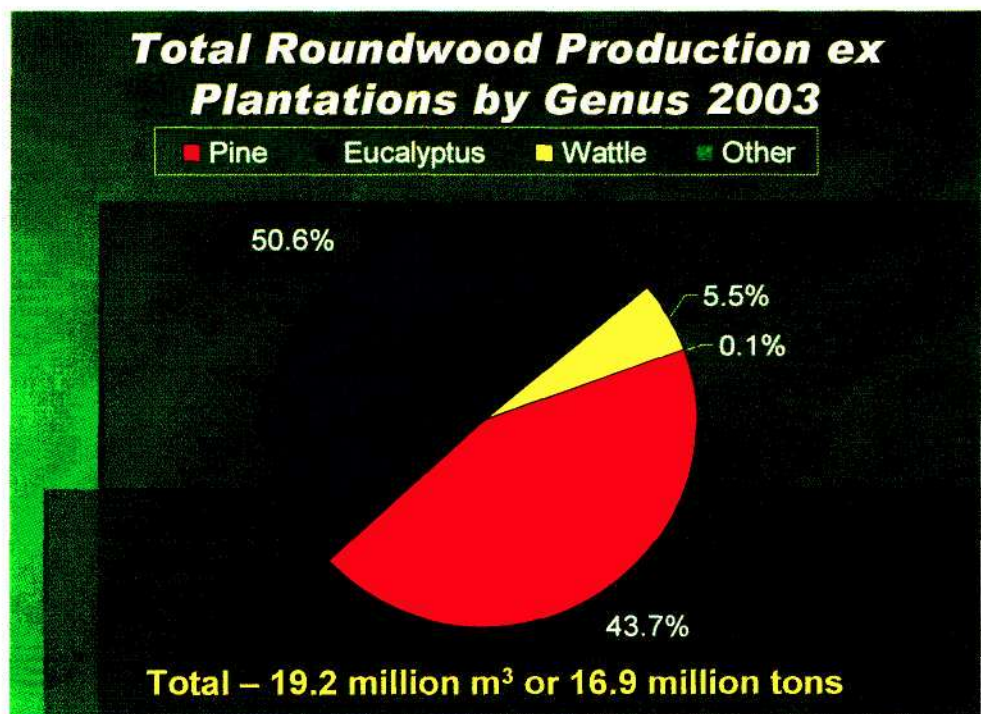
81.1% of the 8.2 million tons of hardwood timber produced annually goes to pulpwood markets, again reiterating the size and importance of this market in the industry.



(Godsmark, 2004)

**Diagram 2.10: Roundwood Production by Genus**

Just over half of the total roundwood produced are Eucalyptus logs. Wattle constitutes a mere 5.5%. Combined the hardwood pulpwood (Eucalyptus and Wattle) make up 56.1% of production.

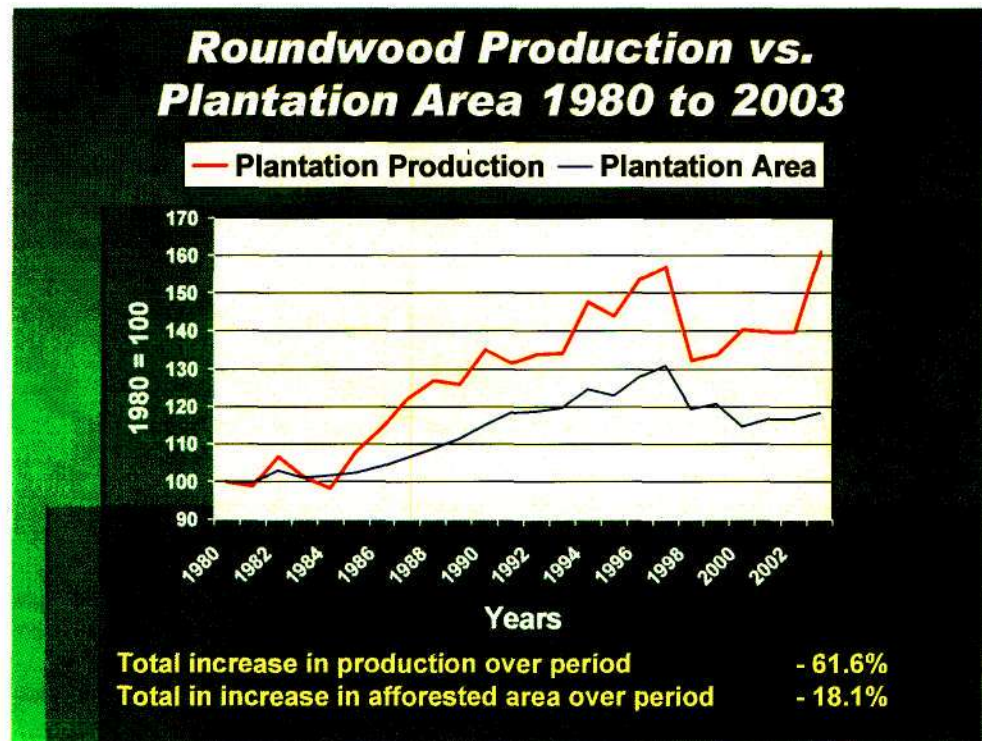


(Godsmark, 2004)



**Diagram 2.11: Roundwood Production vs Plantation Area 1980 to 2003**

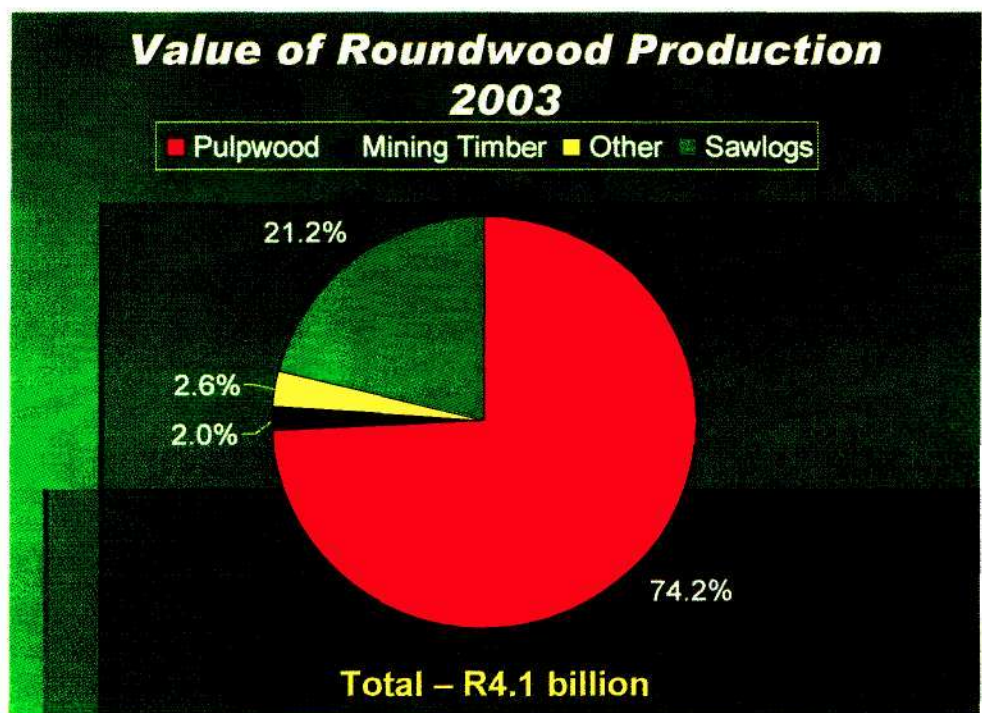
As can be seen from this diagram the increase in production is has not been matched by increases in afforested area. The unwillingness of government to issues more afforestation permits as well as a growing demand for timber products is putting huge pressure on the industry.



(Godsmark, 2004)

**Diagram 2.12: Value of Roundwood Production**

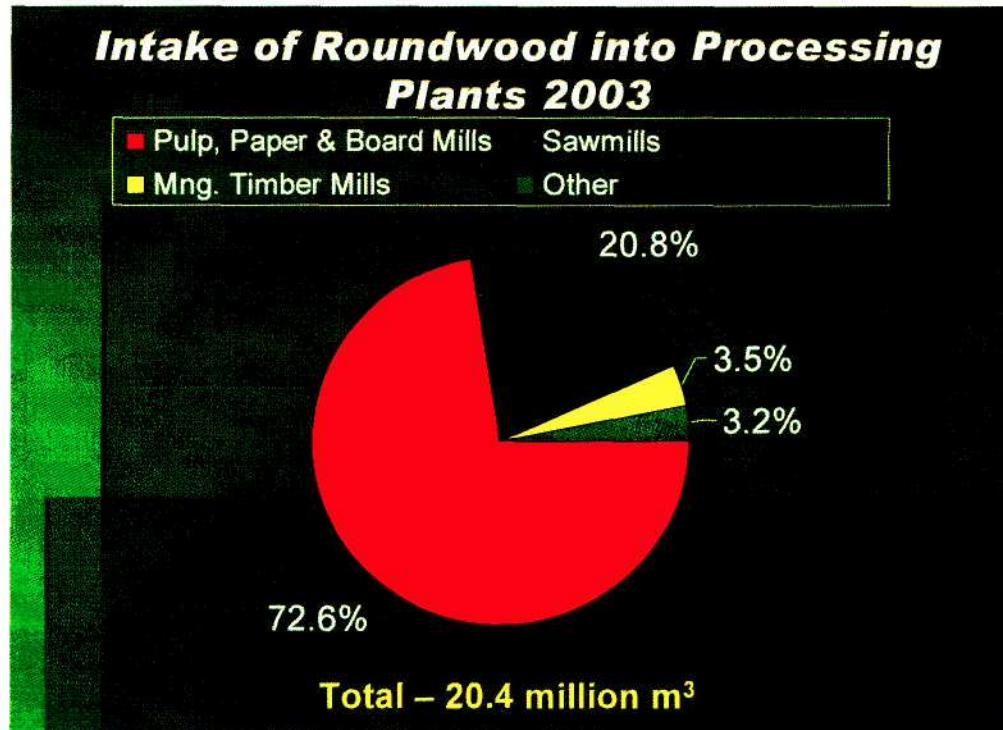
Expressed in Rand terms pulpwood sales made up 2.96 billion rands in 2003 or 74.2% of the total value of roundlog production. Pulpwood sales constitute by far the majority of income generated in the roundwood industry.



(Godsmark, 2004)

**Diagram 2.13: Intake of Roundwood into Processing Plants**

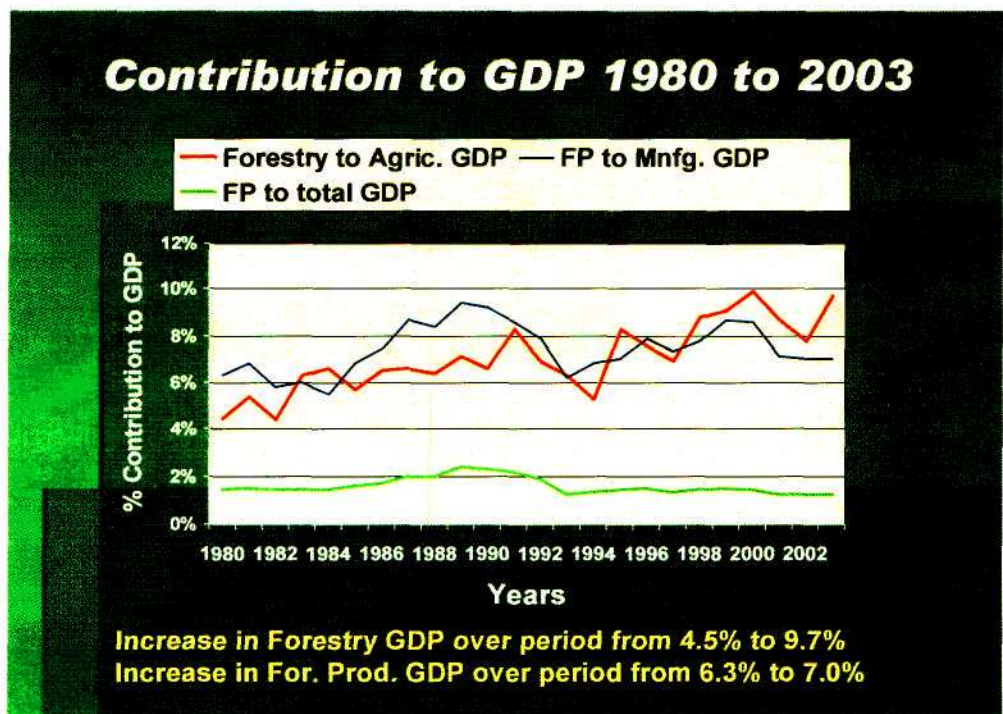
Looking at the role of pulpwood in the industry from an intake into processing plants viewpoint 72.6% of the 20.4 million cubic metres is made up of pulp, paper and board mills.



(Godsmark, 2004)

**Diagram 2.14: Contribution to Gross Domestic Product (GDP) 1980 – 2003**

The Forestry contribution to GDP has increased from 1980 to 2003 from 4.5% to 9.7%. Forestry Products GDP has also increased from 6.3% to 7.0% over the period.

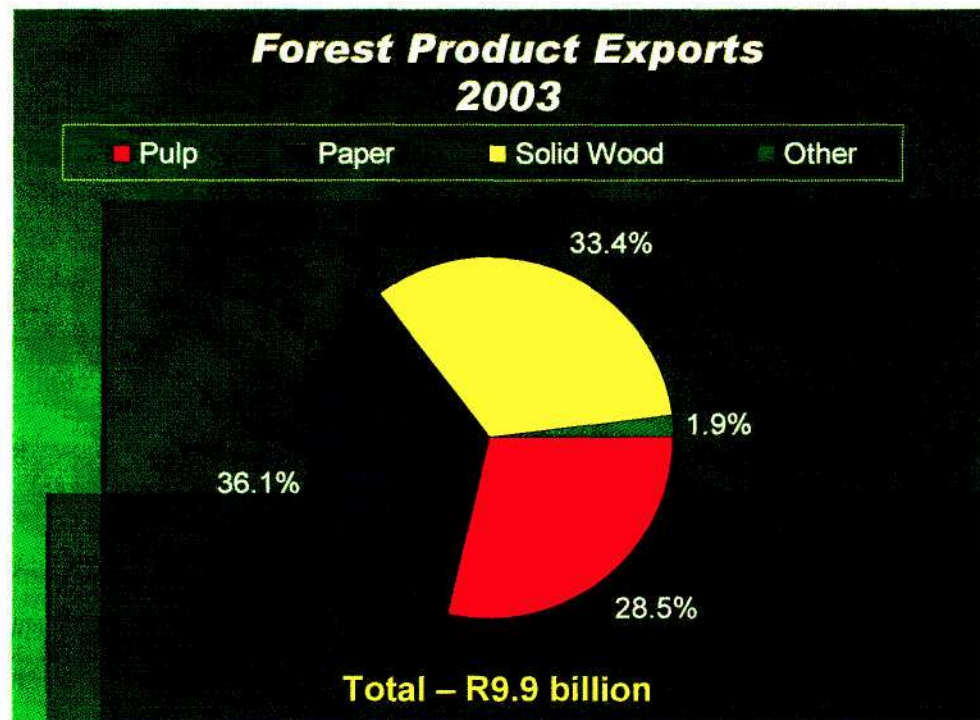


(Godsmark, 2004)



**Diagram 2.15: Forest Product Exports**

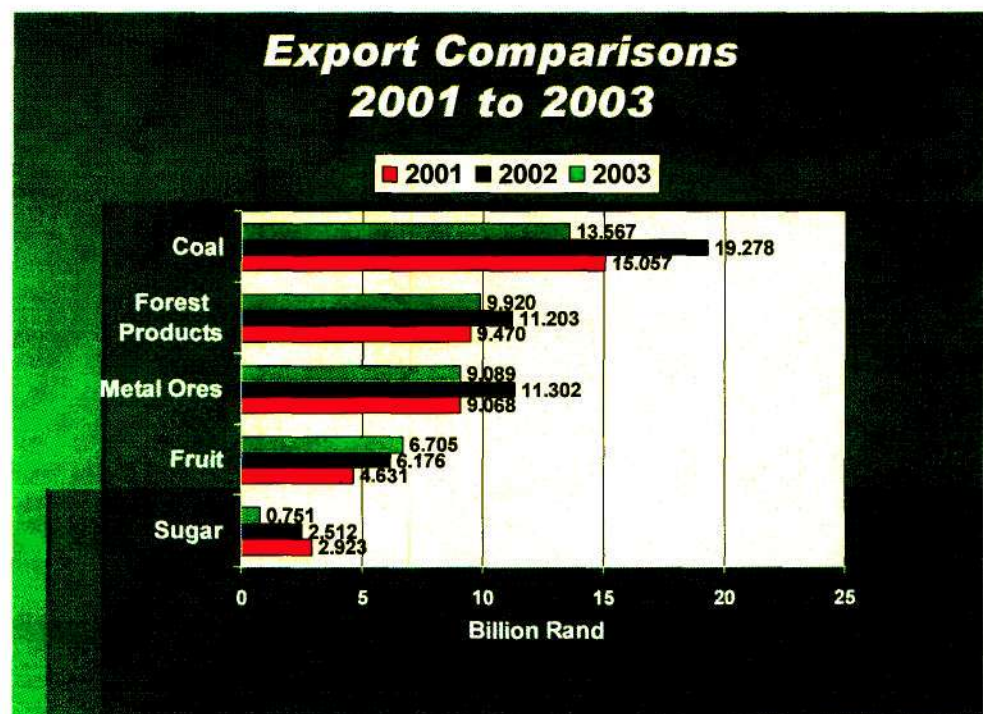
Export ratios are almost equal for pulp, paper and solid wood products.



(Godsmark, 2004)

**Diagram 2.16: Export Comparisons 2001-2003**

Forest product exports made up 9.92 billion rand in 2003. In 2002 against a weak rand exports increased to 11.203 billion from 2001's 9.47 billion. As with any export industry the Forestry Exports are sensitive to the exchange rate.



(Godsmark, 2004)

The preceding diagrams assist in placing the forestry industry into context as a whole. It further highlights the important role of Eucalyptus pulpwood not only to NCT but to the industry, supporting the researchers' focus on this genus, the geographical area of focus as well as the management objective selected.

Understanding the forestry industry in South Africa forms an important backdrop in interpreting the research. Hand in hand with this, an understanding of a co-operative as opposed to a company is required in order to appreciate the nature of an organisation such as NCT Forestry. Section 2.3 and 2.4 provides us with this backdrop

### **2.3 Defining a co-operative**

NCT Forestry is registered as a co-operative under the current South African Co-operatives Act. This might lead one to ask the question, what exactly is a co-operative, and is it indeed any different from other corporate entities? To answer this question let us look at the definition of a co-operative and that of a corporation.

The International Co-operative Alliance (ICA) defines a co-operative as an autonomous organisation of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly-owned and democratically-controlled enterprise (International Co-operative Alliance, 1995, paragraph 1). The ICA goes further in listing the values of co-operatives as that of self-help, self-responsibility, democracy, equality, equity and solidarity. The ICA has determined seven guideline principles by which co-operatives can put their values into practice. They are as follows:

1. **Voluntary and Open Membership:** membership of a co-operative is open to all who can make use of its services and are willing to accept the responsibilities of membership without any discrimination.
2. **Democratic Member Control:** members actively participate in how the co-operative is run and in the decision making process. Some forms of co-operatives operate on a one person one vote principle and whilst others operate on democratic systems linked to patronage. Patronage is defined as the act of support or encouragement of an

organisation (patron) by its customers (The American Heritage Association, 2004, paragraph 1).

3. **Member Economic Participation:** all members contribute equally to the capital of their co-operative and receive limited (and if indeed any) compensation on capital subscribed. Co-operative surpluses are allocated by members to a number of purposes such as setting up reserves to be used in developing the co-operative, as benefits to be paid out to members in proportion to their transactions with the co-operative and to support any other activities they feel appropriate e.g research.
4. **Autonomy and Independence:** all transactions entered into by the co-operative are done in such a manner that member control is maintained thus maintaining the autonomy of the co-op. Member control leads to autonomy in that it allows the organisation to remain a true co-operative in structure, and therefore it exists independent from other organisations and outside shareholders.
5. **Education, Training and Information:** training is provided to members and employees to ensure that the co-operative is run effectively. Information on the nature of and the benefits of the co-op structure is relayed to the general public.
6. **Co-operation among Co-operatives:** members are best served by co-operatives that work together with other co-operatives thus strengthening the co-operative movement.
7. **Concern for the Community:** co-operatives strive for sustainable development in their communities (International Co-operative Alliance, 1995, paragraph 3).

The South African Government's Co-Operatives Bill (B4-2005) defines a co-op as follows:

“an autonomous association of persons united voluntarily to meet their common economic and social needs and aspirations through a jointly owned and democratically controlled enterprise organised and operated on co-operative principles”

The online encyclopaedia, Wikipedia, states that a co-operative combines the equal control characteristics of partnerships with the legal personality conferred on corporations. A co-op is a legal entity owned and democratically controlled by its members, with no passive shareholders. Membership is open to all who meet certain non-discriminatory conditions (Public Servant, 2005, paragraph 2).

In applying the above criteria and definitions to NCT we find that it fully adheres to the seven guideline principles set out by the ICA. Membership of NCT is open to any legal entity wishing to supply timber through the co-operative. Members democratically control NCT by way of a weighted voting system based on patronage. All members joining NCT pay an equal negligible amount in share capital, and in return receive surpluses when available again based on patronage. These shares have no monetary value other than the original price paid for them at the time of issue, therefore should a member redeem his shares he will get refunded the amount that he paid towards the shares initially. No dividends are paid only surplus payments otherwise known as bonuses. Surplus funds have in the past also been used by NCT to fund a number of projects such as the recent construction of its chipping mill in Durban as well as research projects and conservation projects such as its involvement with the Oribi Working Group.

The NCT Board of Directors consists of twelve members, and along with the remaining members they play an integral role in the decision making process of the Co-operative as all major decisions must be approved by members at an annual general meeting or a special general meeting, therefore maintaining member control and the independence of NCT. The Co-operative provides training and education to its members by way of field days and field visits. Information regarding the structure and benefits of NCT is freely available to the public. NCT is a fifty/fifty shareholder in the Central Timber Co-operative (CTC) alongside TWK Agriculture Limited (TWK) and has recently embarked on a joint venture with Södra Cell, a Swedish Co-operative in line with the sixth ICA principle of co-operating with other co-operatives.

NCT has FSC certification, an internationally recognised certification given to organisations adhering to a stringent set of principles ranging from community development, sustainable farming practices, environmentally friendly farming practices and other principles. In order to remain a member of NCT, one must supply timber through the co-op on an ongoing basis.



In the event that a member does not supply any timber through the co-op for a period of ten years, his or her shares are redeemed.

To complete the picture, let us look at a couple of definitions of a corporation.

The dictionary defines a corporation as a separate legal entity having rights, privileges and liabilities separate to those of its members. Further a corporation is usually formed to govern a process, combining a group of people into acting as one body.

(The American Heritage Association, 2004, paragraph 1)

Most companies or corporations exist for the purpose of making profit and their conduct is subject to managerial discretion. The main characteristic of the corporation is the separation of management from ownership (Public Servants, 2003, paragraph 3).

To summarise a co-operative is run and owned by its members and exists for the benefit of said members. The co-op does not exist to make a profit, but rather to benefit its members in which ever way is required. Other forms of corporations or companies have management separated from ownership and aim to generate as much profit as possible for its shareholders. These shareholders do not necessarily benefit from the actual operation of the corporation but are rather investors in it for the profits.

## **2.4 The Pros and Cons of a co-operative in the forestry sector**

Any business model has its advantages and disadvantages, and at the time of writing this, many co-operatives in South Africa were at a point of making a decision whether to remain as co-operatives or whether to convert to companies with the main reason for this consideration being the looming implementation of the new Co-operatives Act. Further general unrest amongst co-operative members prevails due to the liquidation of the Stock Owners Co-operative and the implications of this on its members. Other co-operatives such as the wattle bark co-operative, UCL, have already converted from co-operative to company. The focus of this paper is not to debate the conversion from co-operative to company, however there is value in briefly touching on this subject as well as looking at what the pros and cons are of a co-operative in the forestry sector.

As not much research has been done on this topic in the South African context one must turn to the American forestry sector to provide some insight on the matter, after which one will look at how this applies to the local scenario.

The pros and cons of a co-op model in the American forestry sector were identified by an unknown author in research undertaken by the University of Victoria in British Columbia, Canada (Public Servant<sub>1</sub> & Public Servant<sub>2</sub>, no date).

The three major cons associated with the co-operative model are discussed below. The American perspective is listed first followed by its application to the South African Forestry sector.

- **Con 1 - Unfamiliarity with working co-operatively.**

The forestry sector in the USA is typified by independent minded workers, and often trying to get these independent minds to work together proves a great challenge, fuelled by a combination of the following factors. Firstly most people in the industry are used to being their own bosses or are working in a very strictly defined chain of command, thus either doing exactly what they want or doing exactly what they are told. Secondly many people across industries lack good communication skills and conflict resolution skills, and failure to make joint decisions and resolve conflict has led to the collapse of many a co-operative in the past (Public Servant<sub>1</sub>, no date, paragraph 1).

According to Patrick Kime (2005), General Manager of NCT, this issue in a South African context relates more to the typical worker co-operatives or syndicates found amongst rural people or workers that co-operate to lease or purchase forest land to manage for their gain. Co-operatives such as the Nkandla Co-operative function reasonably well. The reason for the success of these co-operatives in South Africa can be attributed to the fact that typically in South Africa members co-operate well as they are usually operating on tribal land where they have worked together as a community for centuries. However if co-operatives were formed for such purposes amongst independent freehold land operators without clear and specific objectives then we would probably face similar problems to those faced by the Americans. NCT on the other hand, is not a worker co-operative. It was formed by independent minded farmers to assist them to remain just that – independent. It has a clear main objective, being to market member's timber to their best advantage, and members know that they have to co-operate and build up large volumes of pulpwood if this objective is to be met successfully.

The knowledge that they have to co-operate to participate in the very lucrative Japanese market is a great unifier. Private timber growers are also united by the knowledge that they will be oppressed by corporate organisations if they do not unite – so there is both a carrot and a stick.

Therefore overall, the feeling is that this particular con does actually not apply as much to the South African Forestry Industry as it would in the American scenario.

- **Con 2 - Securing Forest Tenure.**

This challenge applies to new co-operatives and in fact to any new company in the industry. Most of the existing forest tenure in the USA has already been allotted to existing organisations and therefore new co-operatives require substantial financial strength in order to buy out existing owners (Public Servant<sub>1</sub>, no date, paragraph 2).

In the South African context members own the forestry land and not the co-operative, and in the past co-operatives like NCT have not attempted to buy up forestry land as these forests would then compete against its own members for market share. Should a co-operative however wish to acquire forestry land in South Africa it would be possible, but probably financially out of reach of emerging co-ops unless they receive some support from government.

Therefore this con does apply to South African co-ops that need to buy up forestry land as most of our forestry land is already owned by someone and this owner would have to be bought out – but it does not apply to co-ops that purely market timber as these do not have buy their own timber but rather just market the timber on behalf of the owner (Kime, 2005).

- **Con 3 - Cost of Start-Up.**

New co-operatives require start up capital and securing this required capital can prove to be difficult as many banks and financial institutions are unfamiliar or hesitant about the co-op model. Many co-ops bypass this constraint by selling shares to its members to raise the capital required (Public Servant<sub>1</sub>, no date, paragraph 3).

According to Richard Golding (2005), Financial Manager at NCT, it is true that many banking institutions in South Africa have limited interaction with co-operatives, as often cheaper finance is available to agricultural co-operatives via the Land Bank.

In South Africa, agricultural co-operatives have an advantage in accessing cheap government finance through the Land Bank. The Land Bank is particularly comfortable with the co-operative principles where farmers become the ultimate beneficiaries of the profits made on the marketing of agricultural products. If a company structure is used, the shareholders of the company are often not the same entities as the suppliers of the products sold by the co-operative and in many instances are not even in the agricultural field.

As the Land Bank was formed to lend to the agricultural sector, the ultimate beneficiaries of the proceeds are of interest to the Land Bank. As most agricultural co-operatives deal with Land Bank it is indeed true that general financial institutions do have a more limited exposure to co-ops in South Africa and therefore have some reservations in dealing with this form of organisation.

On the other hand one finds the pros of the co-op model in the forestry sector. They are set out below and discussed in a similar format to the cons:

- **Pro 1 - Greater purchasing power.**

The pooling of resources through a co-operative allows members to obtain goods and services that are unobtainable or unaffordable to individuals. A co-operative provides bulk purchasing power and negotiation power to its members (Public Servant<sub>2</sub>, no date, paragraph1).

According to James van Zyl (2005), Commercial Manager, NCT, the above statement only refers to the traditional motivation and inherent benefits of collective bargaining – today in the modern South Africa collective bargaining has become even more important – as it determines the possibility or not to do business successfully and not merely effecting the degree to which you can negotiate better commodity prices or discounts for input and production cost factors. All of the South African rail transport (best option for bulk primary commodities) and ports infrastructure which allows for international trade is 100% owned by state owned companies which force National policy implementation such as Black Economic Empowerment (BEE) and monopolistic price setting mechanisms. In most cases the individual farmer will fail to comply/negotiate successfully as a single entity due to complexity of the prescribed processes/legislation and will find it therefore impossible to conduct international business effectively as compliance to these processes are a pre-condition to using the South African rail and ports infrastructure. NCT or the modern co-op provide therefore the traditional benefits, but more importantly assist with making business possible.

- **Pro 2 - Accountability.**

Members within the structure democratically run the co-op, and membership is open to all that meet the co-op's membership criteria, therefore it remains that a co-op is more likely to be held accountable to its members and the communities than other businesses (Public Servant<sub>2</sub>, no date, paragraph 2).

Says Rob Thompson (2005), Assistant General Manager, NCT: "I would agree that the statement above applies specifically to my understanding and experience of a true South African co-operative such as NCT. The co-operative principle indicates that the full benefit of membership (marketing, collective bargaining, expertise, etc) is fed back to the member. Failure to perform therefore 'hurts' the member and thus the member will be the first one to ensure that performance expectations are met satisfactorily." Further to this a co-op's running costs are covered by commission generated from its members, so members are not only the beneficiaries of a well run co-op but also the sponsors and investors holding the co-op accountable for the management of their investment input.

- **Pro 3 – Community Independence.**

The structure of the co-operative allows its members a degree of self determination, allowing for community ownership that prevents outside decision makers from upsetting the direction of the co-operative (Public Servant<sub>2</sub>, no date, paragraph 3).

Dr Carl Seele(2005), Chairman of the NCT Board, fully supports the above statement. In his view, the co-op in the South African perspective not only allows a degree of self determination – but rather absolute self determination within the laws of the country. In South Africa the co-operative allows for voluntary ownership bringing together those seeking a similar service and preventing outside decision makers from interfering and upsetting its direction, as the decision makers remain the members of the co-operative who are also the suppliers and the beneficiaries of its success.

- **Pro 4 – Stability and Risk**

American statistics show that the co-operative model provides more stability and longevity than other business models. Co-operatives have a much higher five year and ten year survival rate, lasting longer than five years 60% of the time compared to a 30% survival rate amongst

private firms. More than half of forestry co-ops survive for longer than ten years whereas only 18% of organisations as a whole survive for longer than ten years in the sector.

The survival and longevity of organisations is especially important in this sector as forestry is a long term crop spanning a rotation of anything from eight to thirty years depending on the end product required (Public Servant<sub>2</sub>, no date, paragraph 4).

The reasons for the failure of companies and co-operatives would have to be investigated more closely. However, even amongst co-operatives in South Africa, the financial models differ. An example of differing financial models is the comparison between NCT and Stockowners. NCT purchases the product from the member and resells at a profit. In addition NCT also charges a commission on the services it offers. In this way, NCT can control how much profit is retained in the co-operative for future expansion (providing the members remain loyal and supply at lower prices). Stockowners, on the other hand, only took commission on sales they assisted the farmer make. Their profitability was limited by the amount of commission they could make. Any future expansion was not provided for, if the running costs of the co-operative exceeded or equalled the commission received. In simplistic terms when they then tried to expand, it destroyed them.

One possible reason why co-operatives may last longer than companies would be that the owners of a co-operative are the suppliers of the raw materials. The shareholders of a company may only be interested in the financial returns from the company and may not be the suppliers of the raw material. They would be interested in getting the raw material for as little as possible, losing the suppliers "loyalty" (Golding, 2005).

- **Pro 5 - Sustainability.**

Sustainable forestry practices are essential to the survival of the communities who rely on the income generated from their forests. This goes hand in hand with one of the primary interests of the co-operative, the sustainable enhancement of the community, and therefore the co-op views sustainable forestry as a priority (Public Servant<sub>2</sub>, no date, paragraph 5).

Craig Norris (2005), Technical Department Manager of NCT says that NCT views sustainable forestry as a priority. This is reflected in the mission statement, and environmental policy. Most forestry organisations take a long term view of their business. This is driven by the fact that timber is a long term crop and to develop a sustainable business requires careful long term planning. Timber has to be harvested on a sustainable basis to ensure the survival of the

business. A co-operative like NCT is owned and run by its members. The members tend to be farmers who have inherited the land and would like their children to eventually take over the management of the farms. This scenario does lead to a 'culture' of sustainability because the land owners would ideally like to hand over a farming operation in a better condition than the one that they inherited.

- **Pro 6 – Community Economic Development.**

Forestry co-operatives create employment by sustaining an industry that is labour intensive, by harvesting non-timber forest products and by producing value added products. Further as most members stem from the local community, the co-ops investments and revenues tend to stay within the community providing financial autonomy for communities (Public Servant<sub>2</sub>, no date, paragraph 6).

Co-operatives started in South Africa as a voice for the farmer allowing them a collective strength when it came to amongst other things marketing and lobbying. With the then strength and stability of the farming sector these co-operative organisations became quite strong. In the Forestry Sector of South Africa the remaining forestry co-operative NCT is today a major player / supplier of resources in and to the industry and can be considered one of the top three major forestry enterprises. Given the importance and standing of the co-op further strength and viability is added to any community operations that are initiated by it. Similarly in an ever changing South Africa to remain a leading enterprise the co-op has to move with the times and embrace the community, gender, employment equity, forest legislation and all other issues required in the New South Africa and the global market. This pro does apply to the South African scenario (Thompson, 2005).

- **Pro 7 – Strengthening Communities**

Forestry co-operatives provide opportunities to the community for education and training, increasing awareness and understanding of the economic, social and ecological value of forestry (Public Servant<sub>2</sub>, no date, paragraph 7).

In South Africa the main function of the forestry co-operative is to market timber on behalf of members (collective bargaining power). Education and training tend to be secondary functions that are provided as a service to members. These services do not generate direct revenue for the co-operative and therefore resources to offer these services are often limited.

Education and training services tend to be reactive rather than proactive. In other words the services are provided only if the members request them (Norris, 2005).

- **Pro 8 – Community Building.**

Co-operatives contribute to a stronger community feeling, as it draws into contact people from all walks of life that would otherwise not have come into contact with each other, creating a sense of ownership and pride in their community (Public Servant<sub>2</sub>, no date, paragraph 8).

In theory one can agree with the above. Experience however tells us that communities (in the South African sense) are often divided by agendas such as political affiliations, crop choice (cane and timber), chase for best perceived return, legislation etc. In some cases communities have no real inclination towards ownership and pride as they live a hand to mouth existence due to poor economic conditions. The presence of a legitimate and well meaning co-op nevertheless must contribute positively towards any community and its success in uniting the community members is largely a factor of the extent of the return it rewards its members with (Thompson, 2005).

- **Pro 9 – Harnessing Community Skills.**

The structure of the co-operative allows for potentially more members than other forms of business. This provides a diverse range of skills, knowledge and resources specific to the industry that can be utilised by the co-operative. As members have a vested interest in the co-op skills are often volunteered rather than hired (Public Servant<sub>2</sub>, no date, paragraph 9).

NCT as a co-op attracts members via its marketing successes and benefits. It does not actively recruit members. All marketing benefits are ploughed back to the member. This therefore corroborates the statement made above. Members are attracted based on their own requirements rather than a company or corporation controlling their intake of staff or beneficiaries based on their ring fenced profit motif. Members of the co-op understand that they stand to benefit directly from the co-ops success and therefore do generally contribute willingly to the welfare of the organisation be that through making resources available for marketing, actively maintaining standards as for example set by the Forestry Stewardship Council (FSC) or contributing skills etc (Thompson, 2005).



- **Pro 10 - Flexibility.**

As a co-operative's first priority is not make a profit for its shareholders it can be flexible in the business objective that it adopts, ranging from obtaining bulk goods at low prices, or creating jobs to organising the selling of goods. This allows the co-op model flexibility not afforded to corporate model (Public Servant<sub>2</sub>, no date, paragraph 10).

This does apply to the South African scenario. The fact that a co-operative does not have to show profits means that it can maximise the prices and bonuses paid to members marketing their timber through the co-op. The knowledge that all profits flow back to members in proportion to patronage is an important reason for members to remain loyal to the co-operative. Co-operatives that have recently converted to companies now have to grapple with this problem as they now lack this flexibility (Kime, 2005).

It is clear that in the case of the forestry sector, both in the American and in the South African context, the pros of a co-operative structure outweigh the cons. In the South African setting many of the cons identified do not even apply fully, therefore it can be said that here the co-operative structure is exceptionally well suited to the forestry industry.

## **2.5 Factors affecting the supply of timber in SA and abroad**

Many factors play a role in the supply of pulpwood to markets. The assumption can be made that one of these factors is the price paid to suppliers, but just how price elastic or inelastic are timber growers? A study done by Brännlund *et al* (1985, p599) in Sweden a number of years ago found supply elasticity to be 0.74, a value smaller than one and therefore indicating that suppliers are relatively price inelastic as a change in price of R1 will result in a change in quantity supplied of 0.74 tons of pulpwood. This can partly be explained by that fact that pulpwood timber prices in Sweden are set at an exogenous level, in other words they are determined without any interaction between demand and supply.

Robinson (1974, p172) did a similar study on the supply elasticity of timber in North America, as did Adams (1977, p50), both finding fairly inelastic supply elasticity's of around 0.2 and 0.5.

Brännlund *et al* (1985, p 603) go further in identifying a cross elasticity between pulpwood timber and saw timber in that the higher the price of pulpwood the more timber is transferred from the saw timber market to the pulp market and vice a versa. This negative relationship indicates that suppliers view pulpwood and saw timber as substitute's products of one another, if the price of the one goes up; the volume to the other is reduced. In Sweden, as is the case in South Africa, one of the difficulties of predicting supply behaviour of private timber growers is the fact that there are many different kinds of timber growers who find themselves in many different situations and who respond in many different ways to economic conditions.

In a study undertaken by NCT in 2005 the following reasons were given by members for decreased supply volumes. 245 members across all classes and of all sizes where contacted by phone, selected on the basis that they have had the biggest decrease in eucalyptus supply over the past year compared their previous years' supply. (Pettit, 2005, paragraph 1)

- **Reasons for decreased eucalyptus supplies**

**Class 1 members**

- 1) Delayed gum felling due to extended wattle season or busy with other activities.
- 2) Over felled in previous years due to cash flow, fires, drought or snow damage
- 3) Economic banking
- 4) Contractor (Harvesting and Transport) / Labour & Mechanical problems.
- 5) Supplying competitors because of price.
- 6) Reduced Timber Resource and conversion to other crops.
- 7) Farm sold / Housing Development / Lease expired / resigned from NCT
- 8) Skewed Age Class Distribution - no or less mature trees at present.
- 9) Have a contract with our competitors (Has not honoured NCT Commitment)
- 10) Other (Deceased, sold standing to NCT member)
- 11) Increased supplies to special markets

**Class 2 members**

- 1) Reduced timber resource.
- 2) Supplying competitors because of price.
- 3) Other - (Illness, liquidation, rail increases = unprofitable to do timber).

**Class 3 members**

- 1) No mature trees.
- 2) Plan to supply in last quarter of this supply season.
- 3) Other - (deceased, sick, sold timber standing, sold farm, price).

**Class 4 member**

- 1) Supplying competitors because of price
- 2) Other - (Sold farm, no mature timber, delayed felling).

**Class 5 members**

- 1) Supplying competitors because of price
- 2) No resource available.

**Class 7 members**

- 1) Supplying competitors because of price.

**Class 9 members**

- 1) Mainly no mature trees.

As can be seen from the list above many different factors have an impact on supply volumes. From this list three main recurring topics can be identified and they are as follows:

- The impact of price in terms of prices offered by competitors
- The impact of operational issues such as harvesting contractor problems, labour problems and the impact of other farming activities.
- Reduced felling or withholding timber due to the economic environment.

With this in mind, and noting that this study by NCT looked at actual volumes supplied in one year compared to that of the actual volumes supplied in the next, it is important to also understand the theoretical model of eucalyptus volumes available for supply. From there onwards a possible correlation between theoretical volumes available, actual volume supplied and the factors identified as having an impact on supplies can be investigated.

## **2.6 Current method used to calculate a theoretical availability of Eucalyptus pulpwood for supply.**

At present NCT makes use a calculation that determines the annual sustainable volume (ASP) that is potentially available per member however, this system is not without limitation. The biggest constraint of the ASP method is that, which is theoretically available is not always practically available, hence the need for this research to identify which factors affect the actual availability.

But first one must look at the method for calculating the ASP of a timber grower as per the NCT Pulpwood Allocation Policy (NCT<sub>1</sub>, 2005, page 1):

### **2.6.1 The ASP calculation method for Eucalyptus for timber growers with sustainable areas (100 ha or more):**

When calculating the ASP for a sustainable land owning timber grower the total hectares per genus is firstly added up. Once this is done the area that should be harvested annually is calculated by taking the total area per genus and dividing it by the recommended rotation age of the genus. In the case of Eucalyptus the rotation age is ten years, therefore this timber should be harvested every ten years or on a ten year rotation. Now that the area to be harvested annually has been calculated the next step is to add up all the timber compartment areas starting from the oldest until the summed areas are greater than or equal to the area to be harvested. The summed area could be smaller than the area to be harvested in the event that the total area consisting of timber deemed mature (in the case of Eucalyptus being five years or older) is less than the area to be harvested. This exercise provides a list of compartments that are to be harvested in the next year. The ASP per compartment is then calculated by multiplying the MAI of the species in the compartment by the age of the timber by the area. The area used to calculate the ASP of the last compartment on the list is adjusted so that the total area of the compartment equals the area to be harvested. The ASP's of all the listed compartments are then added up to provide the total ASP for the genus.

Therefore in mathematical terms:

Sum the Total Hectare's per Genus per trading name, then:

a.  $\text{AREA TO HARVEST} = \text{GENUS AREA} / \text{GENUS ROTATION}$

b. Calculation method:

- i. Sum compartment area ordered on age (oldest first) until the summed area is  $\geq \text{AREA TO HARVEST}$  (The summed area can be  $< \text{area to harvest}$ , if the total area "deemed mature" is  $< \text{genus area} / \text{genus rotation}$ )
- ii. We then effectively have a list of REQUIRED compartments whose summed areas are  $\geq \text{AREA TO HARVEST}$
- iii. We then calculate the ASP per REQUIRED compartment except for the last in the list as follows:  $\text{ASP (per compartment)} = \text{MAI (from species for this comp)} \times \text{AGE (compartment)} \times \text{AREA (compartment)}$
- iv. We calculate the ASP for this last compartment by using an adjusted area to harvest – thus bringing the  $\text{COMPARTMENT HARVEST AREAS} = \text{AREA TO HARVEST}$  (Therefore will only be harvesting a portion of this last compartment)
- v. Summing the ASP's as calculated in (iii & iv) using the formula in (v) gives the ASP per SPECIES.
- vi. We then sum these Species ASP's per GENUS to calculate the total ASP per GENUS.

In all calculations the MAI's (mean annual increment) used to calculate the members ASP's comes from the ICFR's productivity estimates (adjusted to realistic rather than optimum figures), based on climatic variables in Prof Schulze's Atlas. Average MAI's per zone per species are used for members who don't have maps in the planning system.

"Deemed mature" is the minimum age for harvest. For *Eucalypts* the deemed mature age is 5 years.

Let us look at a practical example of an ASP calculation:

A timber farmer has ten compartments of eucalyptus timber on his farm, broken down by area and age as shown in Table 3 below:

**Table 2.1: Compartment listing**

Compartment Number	Area in hectares	Age in years	MAI
001	23	8	21
002	15	7	22
003	25	6	23
004	30	5	21
005	11	10	22
006	6	10	23
007	14	4	23
008	20	3	22
009	26	2	22
010	10	10	21
TOTAL	180		

a. The area to be harvested equals the total area divided by the rotation age of ten years

$$= 180/10$$

=18 ha to be harvested annually

b. Calculation:

- i. The mature compartments summed to equal the 18 ha that should be harvested include compartment number 010 at 10 ha, compartment number 006 at 6 ha and 2ha of compartment number 005.
- ii. This gives us the list of compartments to be harvested in the next year: 010, 006 and 005 (2ha only)
- iii. We now calculate the ASP for each compartment listed except for the last on the list:

$$\text{ASP} = \text{MAI} \times \text{Age} \times \text{Area}$$

$$\begin{aligned}\text{ASP}_{010} &= 21 \times 10 \times 10 \\ &= 2100\end{aligned}$$

$$\begin{aligned}\text{ASP}_{006} &= 23 \times 10 \times 6 \\ &= 1380\end{aligned}$$

- iv. The ASP for the last compartment is calculated by using an adjusted area to harvest in order to bring the compartment area to harvest equal to the area to be harvested as calculated in a.

$$\begin{aligned}\text{ASP}_{005} &= 22 \times 10 \times 2 \\ &= 440\end{aligned}$$

- v. The total ASP for this member for gum is equal to the sum of the ASP's for compartment 010, 006 and 005

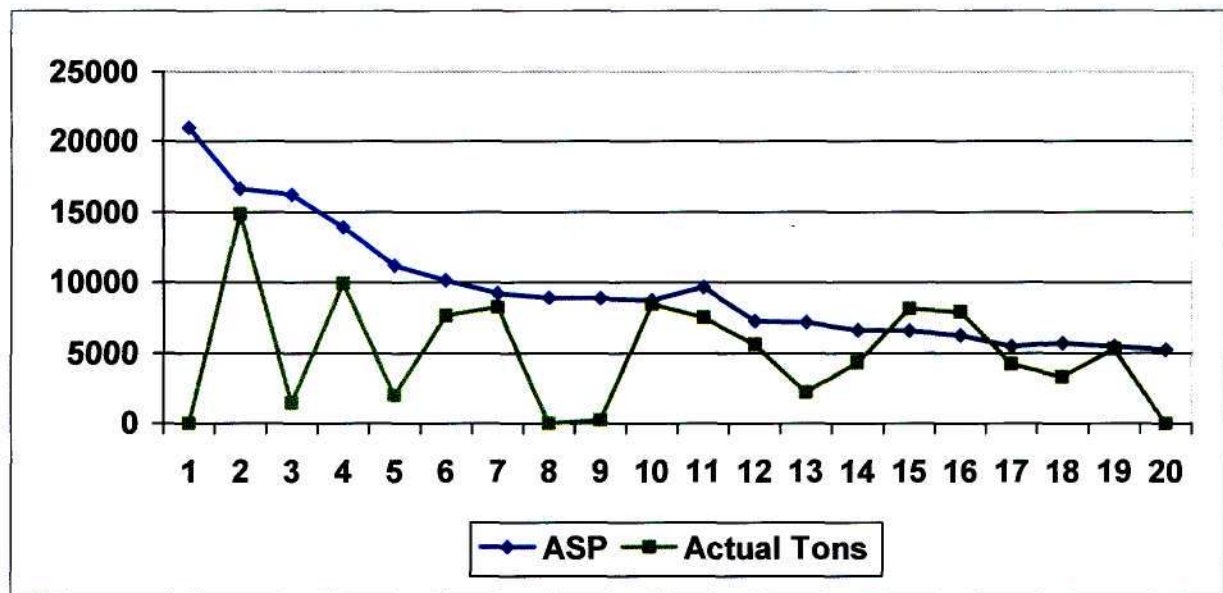
$$\begin{aligned}\text{Total ASP} &= \text{ASP}_{010} + \text{ASP}_{006} + \text{ASP}_{005} \\ &= 2100 + 1380 + 440 \\ &= 3920\end{aligned}$$

- vi. Therefore this member can supply 3920 tons of eucalyptus annually on a sustainable basis.

## **2.7 A disparity between theoretical and actual supply volume**

In order to illustrate the problem faced by any organisation in the timber industry with a diverse and independent supplier base as is the case with NCT the graph below contains the year to date ASP values of actual eucalyptus timber growers as well as their comparative year to date actual tons supplied to pulp markets.

**Diagram 2.17: ASP vs Actual**



In the diagram above the deviation between ASP and actual supplied tons is evident ranging from 22 000 tons supplied less than ASP to 2000 tons supplied more than the ASP. More often than not the ASP value is higher than the actual, and therefore when used to predict supply volumes it tends to be an overestimate and it is from here that the need to identify the variables that cause the deviation is evident.

In summary it is clear from the literature reviewed in this chapter that the Forestry industry plays an important role in the South African economy and that it comes with its own set of unique properties and challenges. Furthermore it has also been shown that the co-operative structure is suited to the industry in South Africa as the pros of this structure by far outnumber the cons. The system currently used by NCT to forecast its supplies is clearly not accurate enough for the current dynamic supply environment that they find themselves in.

With this understanding of the forestry industry, as well as what being a co-operative entails, and having looked at factors affecting supply and current methods used to forecast volumes the backdrop to the research has been set.

What follows is an explanation of the research methodology used to identify and measure these variables.



## **Chapter 3**

### **The Theory of Constraints**

#### **3.1 Introduction**

In this chapter Eliyahu M. Goldratt's theory of constraints will be discussed and briefly outlined. This theory has in past research been successfully applied to many research problems relating to supply and productivity issues, and has spread as a noteworthy managerial philosophy over the last twenty years (Ronen, 2005, p.1). It has been successfully implemented in a number of areas including production, logistics, distribution and sales and marketing in both big and small organisations. When implemented properly this managerial tool could lead to significant results (Ronen, 2005, p.1).

At the end of this chapter various examples will be presented indicating the application of the theory of constraints in industry.

#### **3.2 The Theory of Constraints (TOC)**

The challenge faced by NCT is to secure its timber resource from members and to get the timber delivered in time at the respective mills – or in other words NCT suffers from unreliable raw material deliveries and raw material shortages. Eliyahu M. Goldratt's theory of constraints is a management philosophy that views an organisation not as a group of independent processes but rather as a complete system. In this theory the principle applies that an organisation is only as strong as its weakest link, and that this weakest link prevents the system from achieving unlimited success. Goldratt (1990, p23) further maintains that by identifying your organisations constraints and by improving on these constraints the entire organisations performance will improve. The theory of constraints provides a framework that can be used to continually identify and improve constraints in a organisational chain (Rizzo, 1996, paragraph 1, 4).

According to Patrick (1996, paragraph 5), a business suffering from long supplier lead-times, incoming quality problems, late or unreliable raw material deliveries, raw material shortages and poor quality is likely to have constraint in its supply chain and in the policies and practices associated with supplier relationships. As mentioned before, a challenge faced by NCT is to secure a reliable resource supply from its members, therefore applying Patrick's theory one can determine that NCT is faced with a constraints in its supplier relations. The challenge therefore is to determine how to get better delivery performance from its members in order to be effective.

The question arises how does one "control" over 2000 members that are not in your sphere of direct control? The answer, according to Patrick (1996, paragraph 7) is to become their "preferred customer" or in this case their preferred timber marketing agent. This is obtainable by finding a way to impact on performance external to the organisation's direct control – or in other words by finding a way to manage an external constraint.

In order to effectively attend to an external constraint the organisation needs to create and present an offer that firstly alleviates the impact of the external constraint on the organisation's performance and secondly provides the external constraint with significant, quantifiable bottom line benefits. In creating the above, the organisation creates a win-win situation and an irrefutable offer. The key to construct such an offer lies in creating a shift in the way that the organisation's offer is valued by the external constraint (Patrick, 1996, paragraph 8).

The organisation needs to create a shift in focus from a solely price based focus where all the other important elements offered by the organisation are left un-quantified, to a focus that is based on "price related to bottom line benefits." The main action required to achieve this is quantifying the value of the offer in terms of its impact on the external constraint's bottom line (Patrick, 1996, paragraph 9).

It is important that the organisation looks at the bottom line through the eyes of the supplier as bottom line is not necessarily net profit, but could be cash flow, return on investment or inventory turns. Once it is clear what is considered important by the supplier the organisations offer can be quantified in a way that the supplier value's the offer on the basis of the bottom line benefits it gets for the price rather than simply just the price (Patrick, 1996, paragraph 10).

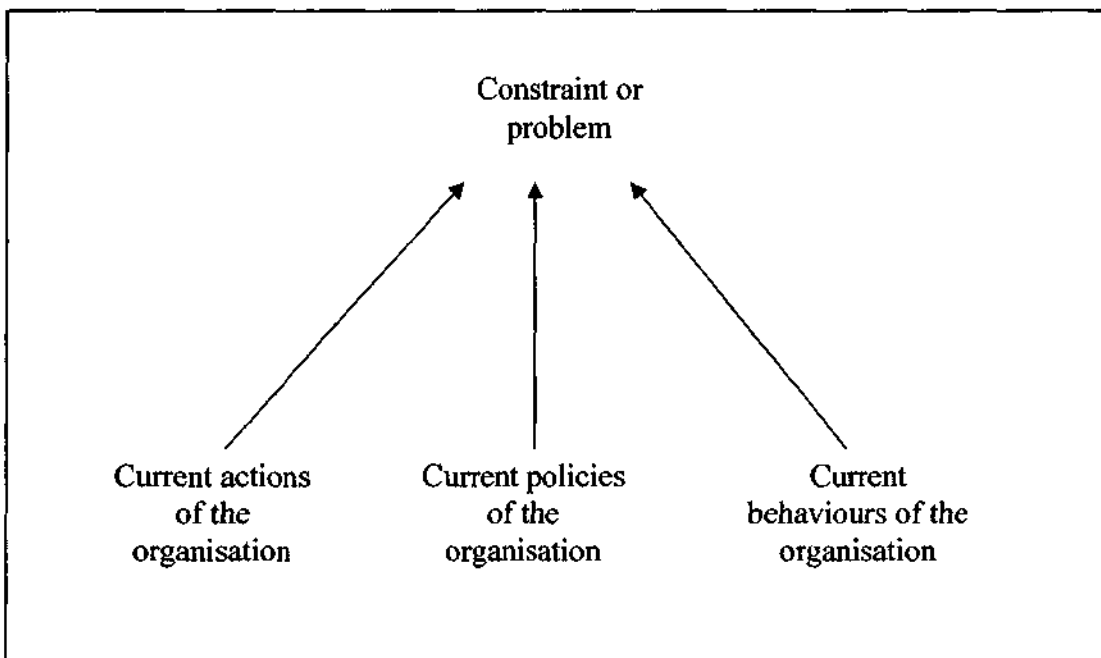
The theory of constraints presents a set of tools and techniques used to analyse and determine a problem solving methodology. Three questions need to be answered in this problem solving process. They are:

1. What to change?
2. What to change to?
3. How to make the change happen?

In order to determine the answer to question one above, we need to assess the situation and identify the core problem and assumptions that sustain it. Tools to assist with this process include the evaporating cloud, generic cloud and current reality tree. In this instance the Current Reality Tree is investigated as it applies to NCT.

Diagrammatically expressed, the Current Reality Tree takes the following form:

**Diagram 3.1: The Current Reality Tree**



(Patrick, 1996, paragraph 3)

Therefore *if* the current actions of the organisation continue *then* constraints and or problems are incurred, or, *if* the current policies, and the current actions, and the behaviour continue

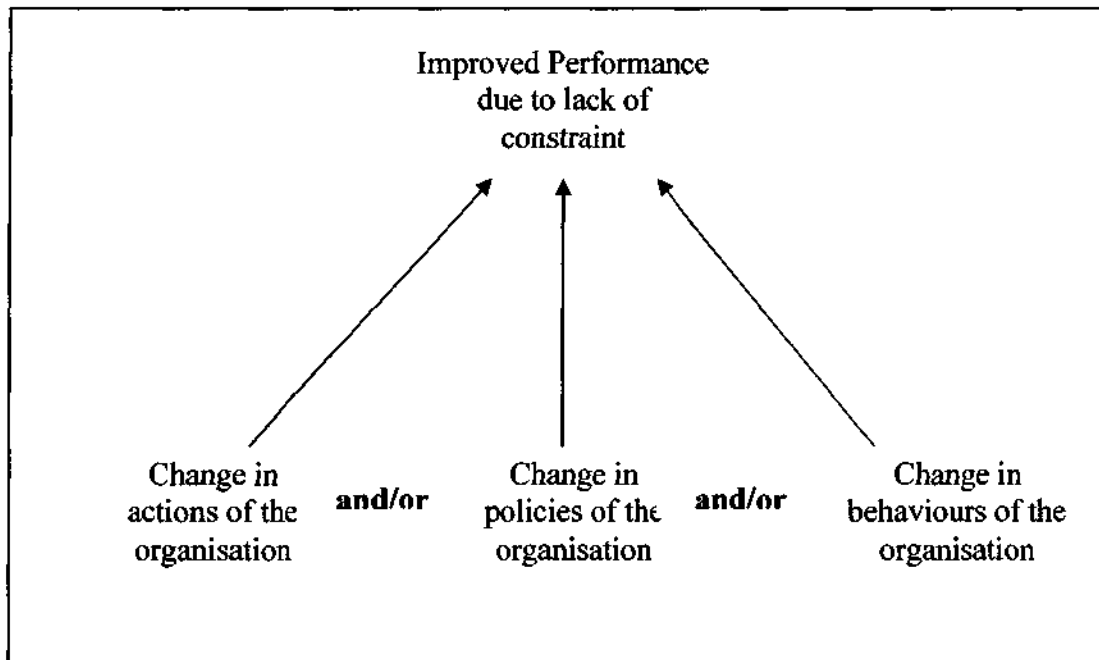
*then* constraints and or problems are incurred. A cause and effect relationship thus exists (Patrick, 1996, paragraph 1).

The objective of this study is to determine the cause or causes of the unreliable resource effect that NCT is experiencing by way of a member (supplier) survey.

Once the cause or causes are determined the answer to the second question of what to change to is obtained. This is illustrated by using the Future Reality Tree.

Diagrammatically expressed, the Future Reality Tree takes the following form:

**Diagram 3.2: The Future Reality Tree**



(Patrick, 1996, paragraph 6)

By inserting the new proposed actions, behaviour and or policies into the future reality tree a new vision of the future reality of the system is created. In this if-then scenario removing or changing the lower levels in the tree result in a change to the item/s above the changed level. The organisation now knows what to change, and what to change to (Patrick, 1996, paragraph 4).

But how is this change effected? The theory of constraints offers useful tools as assistance to this third question. The Prerequisite Tree is used to make the change happen. The Prerequisite Tree uses people's natural tendency to point out why something will not work or can not be done. In building the Prerequisite Tree all the obstacles identified by the team are collected, and then each individual identifies an intermediate objective that will overcome the obstacle that they raised. Each intermediate objective is then sequenced into the plan and used as building blocks to reach the final objective. The more obstacles that are raised the more complete the implementation plan (Patrick, 1996, paragraph 58).

### **3.3 Application of the Theory of Constraints**

The first example of the theory applied stems from the integrated poultry industry in India, followed by an example of how the theory is applied in the foodservices industry in Akron, USA.

The integrated poultry business (IPB) in India is a complex business system in that variable costs, sales prices and product yields are not known at the time of making production decisions. Further more these factors can change as often as on a daily basis. As background the IPB is cash transaction based and consists of poultry farms, hatcheries, parent birds, feed suppliers and customers all scattered within a 300km radius. Its key business activities include growing parent birds, producing hatching eggs and day old chicks, growing day old chicks until they reach saleable age, and selling the grown birds. (Chaudhari and Mukhopadhyay, 2003, p799).

The TOC thinking process was applied to identify and resolve the conflicts relevant to the policy constraints found in IPB. Evaporating Clouds were used to identify conflicting sales policies. From the Evaporating Clouds a Current Reality Tree was drawn up to validate assumptions made in the current process. Following this process the company's policies were changed to be in line with valid assumptions only rather than all assumption as was previously the case (Chaudhari and Mukhopadhyay, 2003, p817).

The food service industry is one of the largest industries in the world comprising of a number of very big names such as Unilever, Sysco, Safeway, Kellogs and Heinz (Business Week,

2000, p11). In this competitive industry outwitting the competition is essential for survival (Public Servant<sub>6</sub>, 2006, paragraph 1).

According to Ahmed (2005, p26), even though this industry is supported by a large amount of theoretical and practical knowledge it can glean some valuable insights from an approach such as the Theory of Constraints. Applying this theory to the foodservices industry in the USA he suggests that in practice TOC starts at the end results and works its way back to the beginning identifying the right constraints and addressing them in such a manner that customer value is enhanced or retained.

Looking at an example TOC and its application and assuming food costs are running higher than expected in a restaurant, upon investigation it is found that the reason for this is that standard portion sizes are not adhered to and that certain servers are serving slightly more than what they should. One reaction could be to reduce all portion sizes to comprise for the over serving, however this might lead to customers perceiving that they are getting less value for their money. A better solution would be to train servers in the correct serving. The TOC uses a process diagram to identify aspects that customers value and should perhaps not be tampered with (in this example portion size), as well as those that are not valued and could be changed, thereby assisting in maximising a variety of factors to obtain an overall improvement. Its focus is thus not on maximising every single factor, but rather on improving the overall performance (Ahmed, 2005, p26).

In conclusion, the TOC is indeed a useful tool to identify and address constraints found in any supply chain. What makes it even more so is that it does not addresses constraints in isolation but rather as part of a bigger system. This characteristic of the TOC ensures that constraints alleviated also leads to overall improvement in the system.

With the theoretical framework drawn, focus is shifted to background on the forestry industry in South Africa.

## **Chapter 4**

### **Research Methodology**

#### **4.1 Statement of the problem**

In recent times a need has developed within NCT for a more accurate prediction of pulpwood available from its members for supply to strategic markets. Present systems indicate the volume of timber per member per farm, however this volume has been found not to be an accurate prediction of what will actually reach the mill at the end of the day as many factors come into play and influence the volume that reaches the mill. The question therefore arises: which factors influence the availability of marketable Eucalyptus pulpwood timber, and to what extent do the different factors play a role? It was with this problem in mind that a comprehensive survey was undertaken to evaluate a number of factors identified and to try and determine their impact on the volume of Eucalyptus pulpwood supplied.

#### **4.2 Research Objectives**

Research Objectives:

- To identify the variables that impact on the supply of eucalyptus pulpwood timber.
- To quantify the impact of the main variables on supplies.
- To weight the identified variables according to the significance of their impact on supplies.
- To develop a practical model that calibrates the annual supply potential against the weighted variables
- To identify any similarities between the four districts with regards to issues affecting supply.
- To identify differences between the four districts with regards to issues affecting supply.

### **4.3 Research Design/Strategy**

As was seen in Chapter 3 it has been found that even though the ASP calculation is an accurate predictor of the potential volume available for supply it is not an accurate predictor of volumes that will actually reach the mill at the end of the day. The ASP of a timber grower provides a base from which a supply forecast can be calculated, however to do this accurately factors that impact on the actual volume of timber supplied need to be identified and their impact understood. It is with this in mind that primary research was conducted amongst the biggest 150 eucalyptus timber growers – biggest in terms of ASP. A questionnaire containing 17 statements relating to issues that could potentially impact on supply volumes was sent out to the sample group. The design of the questionnaire and the sample follows.

#### **4.3.1 Questionnaire Design**

Poorly designed studies can render research worthless. To ensure that this does not happen research must be designed to adhere to the principles of reliability and validity (Breakwell et al, 1995, p56). Reliability refers to the extent to which observations or measures are constant or stable. Validity on the other hand refers to the degree to which what was observed or measured is the same as what was alleged to be observed or measured (Rosnow and Rosenthal, 1996, p413 & 417). Reliability is tested by replication, therefore if by applying the same experimental design the same results are obtained the research design can be deemed reliable (Breakwell et al, 1995, p56). In this study the research design consisted of questionnaires with a Likert scale, a method that has been tried and tested. However it must be noted that reliability does not guarantee validity. Validity according to Breakwell et al (1995, p57) refers to whether the research method explains what it claims to explain. In this case the questions used in the questionnaire were designed to draw out information regarding the dissertation topic testing the respondents sensitivity to certain issues. The content was then tested by two industry experts for content validity.

All respondents were provided with addressed and stamped return envelopes and the questionnaires remained anonymous. Respondents were however asked to indicate the district they come from.



The questionnaire consisted of 17 statements rated on a Likert scale by respondents based on the degree of impact that the factors in the statements have on their Eucalyptus pulpwood supplies. The scale consists of five options, Almost Never, Seldom, Sometimes, Often and Almost Always. A column was provided where respondents could comment on any of the statements if required. In addition a number of blank lines were included at the end of the questionnaire and respondents were asked to list and comment on any other factors that have or potentially can reduce their Eucalyptus pulpwood supplies through NCT.

What follows is a brief listing of the statements, as well as a short background as to why they have been included in the questionnaire:

*Statement 1: Supplies to other agents or buyers initiated in the last 24 months reduce my NCT supply volumes.* This statement aims at quantifying the effect of other competitive markets on the NCT supply volumes.

*Statement 2: A R5 decrease relative to alternative buyers in the price that NCT pays for Eucalyptus pulpwood will reduce my NCT supplies.* This statement tests whether a difference in price of R5 per tonne between NCT and its competitors is enough to affect tonnes supplied.

*Statement 3: A R10 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.* This statement tests whether a difference in price of R10 per tonne between NCT and its competitors is enough to affect tonnes supplied.

*Statement 4: A R20 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.* This statement tests whether a difference in price of R20 per tonne between NCT and its competitors is enough to affect tonnes supplied.

*Statement 5: A lack of service from NCT reduces my supplies.* This statement was included to highlight a service related impact on supplies.

*Statement 6: My other farming activities reduce my timber supplies.* This statement test whether other farming activities such as sugar cane farming has impacted on supplies.

*Statement 7: Labour and/or contractor problems reduce my supplies.* This statement tests the impact of labour and contractor problems on supplies.

*Statement 8: A lack of transport reduces my supplies.* This statement tests the impact of transport problems on supplies.

*Statement 9: The possible non-payment of commitment bonuses reduces my supply volumes.* This statement aims at quantifying the effect of bonuses not being paid by NCT on supplies.

*Statement 10: My supplies to other non-pulpwood markets e.g. pole markets and special markets reduce my pulpwood available to NCT.* This statement tests the impact of supplies to other markets on the tonnes available for pulpwood sales.

*Statement 11: Recent investments made by NCT, in for example Durban Woodchips and Pulp United, has prompted me reduced my supplies to NCT.* This statement tests whether NCT suppliers might not have agreed with the aforementioned NCT investment decisions and subsequently have reduced their supplies.

*Statement 12: The fact that NCT as a co-operative has not converted to a company has prompted me to reduce my NCT supplies.* This statement tests whether NCT's decision to remain a co-operative for the time being has prompted suppliers to reduce supplies.

*Statement 13: NCT systems and procedures have prompted me to reduce my NCT supplies.* This statement investigates the impact of NCT systems and in house procedures as a factor affecting supplies.

*Statement 14: At a mill delivered price of R230/ton I will stop/slow down harvesting and bank my timber.* This statement tests whether suppliers will slow down or stop supplies at a very low price of R230/ton without at this point selling to opposition markets.

*Statement 15: At a mill delivered price of R250/ton I will stop/slow down harvesting and bank my timber.* This statement tests whether suppliers will slow down or stop supplies at a low price of R250/ton without at this point selling to opposition markets.

*Statement 16: At a mill delivered price of R270/ton I will stop/slow down harvesting and bank my timber.* This statement tests whether suppliers will slow down or stop supplies at a fairly average price of R270/ton without at this point selling to opposition markets.

*Statement 17: At a mill delivered price of R290/ton I will stop/slow down harvesting and bank my timber.* This statement tests whether suppliers will slow down or stop supplies at a good price of R290/ton without at this point selling to opposition markets.

Furthermore the statements in the questionnaire are subdivided or grouped into four groups based on the similarity of the topics that they cover. These are as follows:

**Topic: Price Competition**

This group is made up of the following statements:

*Statement 1:* Supplies to other agents or buyers initiated in the last 24 months reduce my NCT supply volumes

*Statement 2:* A R5 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.

*Statement 3:* A R10 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.

*Statement 4:* A R20 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.

*Statement 9:* The possible non-payment of commitment bonuses reduces my supply volumes.

*Statement 10:* My supplies to other non-pulpwood markets e.g. pole markets and special markets reduce my pulpwood available to NCT.

(This statement has been included in the price competition topic as supplies to other non-pulpwood markets are generally a function of the price of pulpwood. A good pulpwood price leads to a decrease in supplies to other markets and a low pulpwood price to an increase in supplies to other markets.) (Appendix A: Questionnaire)

**Topic: NCT Issues**

This group is made up of the following statements:

*Statement 5:* A lack of service from NCT reduces my supplies

*Statement 11:* Recent investments made by NCT, in for example Durban Woodchips and Pulp United, has prompted me reduced my supplies to NCT.

*Statement 12:* The fact that NCT as a co-operative has not converted to a company has prompted me to reduce my NCT supplies.

*Statement 13:* NCT systems and procedures have prompted me to reduce my NCT supplies.

(Appendix A: Questionnaire)

**Topic: Operational Issues**

This group is made up of the following statements:

*Statement 6:* My other farming activities reduce my timber supplies.

*Statement 7:* Labour and/or contractor problems reduce my supplies.

*Statement 8:* A lack of transport reduces my supplies.

(Appendix A: Questionnaire)

**Topic: Banking (not harvesting mature timber for a period of time, rather holding it back for future supply)**

This group is made up of the following statements:

*Statement 14:* At a mill delivered price of R230/ton I will stop/slow down harvesting and bank my timber.

*Statement 15:* At a mill delivered price of R250/ton I will stop/slow down harvesting and bank my timber.

*Statement 16:* At a mill delivered price of R270/ton I will stop/slow down harvesting and bank my timber.

*Statement 17:* At a mill delivered price of R290/ton I will stop/slow down harvesting and bank my timber.

(Appendix A: Questionnaire)

### **4.3.2 Sample Design**

Primary research in the form of a survey has been used to answer the research question of which factors influence the availability of marketable Eucalyptus Pulpwood timber, and to what extent do these different factors play a role? A sample, consisting of a number of major suppliers representing the geographical districts, was selected. As NCT members are private timber farmers the respondent receiving the questionnaires in each case is the farm owner. In order to determine the scale involvement by the various districts within NCT, the following was considered:

Overall NCT has 2035 shareholding members, of which 1401 members are land owners and the remaining 634 contractors. Within NCT, members are subdivided into six district areas. Each district has a district office with staff dedicated to servicing the needs of the members in its district.

The six district areas are as follows:

- George – Including Reenendal, Knysna and the Eastern Cape.
- Greytown – Including Kranskop, Ahrens, Umvoti, Seven Oaks, Stanger, NewGuelderland, Lower Tugela.
- Nelspruit – Including Mpumalanga, Swaziland North, Northern Province and Gauteng.
- Northern Natal- Including Helpmekaar, Newcastle, Vryheid, Kambule, Utrecht, Louwsberg, Paulpietersberg, Luneberg, Commondale, Piet Retief and Swaziland South
- Southern Natal – Including Tongaat to Port Shepstone on the south coast, to the Drakensberg in the west, and north into the midlands, Mooi River, Karkloof and New Hannover.
- Zululand – Including Melmoth, Eshowe, Nkandla, Babanango, Nongoma, and the North Coast.

The breakdown of shareholding land owning member per District Area is as follows:

- George: 31 members or 2%
- Greytown: 160 members or 11%
- Nelspruit: 130 members or 9%

- Northern Natal: 231 members or 16%
- Southern Natal : 547 members or 39%
- Zululand: 302 or 22%

Further to this breakdown it must be noted that the George and Nelspruit districts fall outside the strategic market catchments for Richards Bay and Durban, and therefore for purposes of this study can be excluded from the sample. The members remaining in the strategic catchments now come to 1240.

The breakdown of shareholding land owning members per district area that falls in the strategic market catchments is now as follows:

- Greytown: 160 members or 13%
- Northern Natal: 231 members or 19%
- Southern Natal : 547 members or 44%
- Zululand: 302 or 24%

The suggested sample size for the study is 150 members which equate to 12% of the members in strategic catchments. The criteria for selecting the members to participate in this study are the size of their ASP's for Eucalyptus and their membership class. The 150 biggest Class 1 members in terms of Eucalyptus ASP where selected as the sample group. Class 1 members are shareholding sustainable timber growers who have committed all their pulpwood supply to the co-op. As supplies from Class 1 members make up the biggest portion of sustainable supply to NCT it was decided use them as a focus for the study.

Class 1 members with Eucalyptus per district:

• Greytown:	32	(11%)
• Northern Natal:	96	(35%)
• Southern Natal:	110	(40%)
• Zululand:	40	(14%)
• <b>Total number of members:</b>	<b>278</b>	<b>(100%)</b>



The above ratios were used to determine the number of members to sample per district and along with the abovementioned other selection criteria the final sample group broken down by district looks as follows:

• Greytown district members:	15	(10%)
• Northern Natal district members:	59	(39%)
• Southern Natal district members:	57	(38%)
• Zululand district members:	19	(13%)
• <b>Total number of members sample group:</b>	<b>150</b>	<b>(100%)</b>

#### **4.3.3 Data Collection**

With the sample group being relatively large and geographically dispersed personal interviews were ruled out as a method of data collection as this would have been a time consuming and expensive exercise. Further to this, as the questionnaire is fairly lengthy a telephone interview would have been time consuming and members could have possibly felt overwhelmed by the amount of information required from them over the phone. As a result of these considerations the questionnaire was sent out by post to the sample group asking them to return it by way of return mail within a three week period. A couple of days prior to the deadline a cell phone text message was sent to all the members in the sample group reminding them to complete and return the survey had they not done so already. By the deadline date a response of 32% or 48 responses was achieved. Data collection was undertaken by the researcher with no additional assistants employed.

#### **4.3.4 Data Analysis**

Results are firstly presented in a summarised table broken down per district, showing the response in percentage format followed by a frequency table. These statistical procedures were chosen on grounds of their ability to provide the reader with a picture of the results. Rosnow and Rosenthal (1996, p214) states that in order to emphasise patterns in research data visualising techniques are most effective. As this study aimed at identifying supply trends this technique is appropriate. Comments made by respondents are listed grouped by topic for ease

of reference. The results are followed by an in depth discussion and interpretation. The process is repeated for each district and then again when analysing the overall results across districts.

In order to determine the average score per statement and to be able to measure and evaluate each of the questions a scoring system has been created on the following basis:

Each response to a question is given a score with the response having the least impact on supply (almost never) marked a 0, assuming that the effect in this case is insignificant and therefore is left out of the equation, and increasing by 1 for each subsequent response, with the response of almost always given the highest mark of 4. All responses are then totalled, and expressed as a percentage against the highest possible score as can be seen from the following example:

Statement 1: Supplies to other agents or buyers initiated in the last 24 months reduce my NCT supply volumes.

**Table 4.1: Response scoring**

<u>Respondent</u>	<u>Almost Never</u>	<u>Seldom</u>	<u>Sometimes</u>	<u>Often</u>	<u>Almost Always</u>	<u>Score</u>
1	x					0
2		x				1
3			x			2
4				x		3
5					x	4
<b>Score</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>10</b>

A factor that heavily influences supply will be marked as almost always, scoring a 4, therefore if all 5 respondents marked this statement as almost always the highest possible score would be 20 (4x5). The actual score is 10 (0+1+2+3+4). The assumptions can be made based on this scoring system that this factor does impact in the supply volume as the statement scored 50% (10/20).

From here the statement having the biggest impact can be identified as well as the one with the least impact.

Further to this and in order to provide a clearer picture, the statements listed in the questionnaire (see Appendix A) are grouped by topic and then given a weighted score. The grouping and topics are as follows:

**Topic: Price Competition**

This group is made up of the following statements:

*Statement 1:* Supplies to other agents or buyers initiated in the last 24 months reduce my NCT supply volumes

*Statement 2:* A R5 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.

*Statement 3:* A R10 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.

*Statement 4:* A R20 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.

*Statement 9:* The possible non-payment of commitment bonuses reduces my supply volumes.

*Statement 10:* My supplies to other non-pulpwood markets e.g. pole markets and special markets reduce my pulpwood available to NCT.

(This statement has been included in the price competition topic as supplies to other non-pulpwood markets are generally a function of the price of pulpwood. A good pulpwood price leads to a decrease in supplies to other markets and a low pulpwood price to an increase in supplies to other markets.)

**Topic: NCT Issues**

This group is made up of the following statements:

*Statement 5:* A lack of service from NCT reduces my supplies

*Statement 11:* Recent investments made by NCT, in for example Durban Woodchips and Pulp United, has prompted me reduced my supplies to NCT.

*Statement 12:* The fact that NCT as a co-operative has not converted to a company has prompted me to reduce my NCT supplies.

*Statement 13:* NCT systems and procedures have prompted me to reduce my NCT supplies.

**Topic: Operational Issues**

This group is made up of the following statements:

*Statement 6:* My other farming activities reduce my timber supplies.

*Statement 7:* Labour and/or contractor problems reduce my supplies.

*Statement 8:* A lack of transport reduces my supplies.

**Topic: Banking (not harvesting mature timber for a period of time, rather holding it back)**

This group is made up of the following statements:

*Statement 14:* At a mill delivered price of R230/ton I will stop/slow down harvesting and bank my timber.

*Statement 15:* At a mill delivered price of R250/ton I will stop/slow down harvesting and bank my timber.

*Statement 16:* At a mill delivered price of R270/ton I will stop/slow down harvesting and bank my timber.

*Statement 17:* At a mill delivered price of R290/ton I will stop/slow down harvesting and bank my timber.

As there is not the same number of questions per topic the total score for the statements per topic group has been weighted. For example; the topic with the least number of statements is operational issues with three statements relating to this issue. Therefore the combined score of these statements are multiplied by a factor of 1. Both the NCT issues group and the Banking group have four statements each and the combined score for the four relative statements is therefore multiplied by a factor of 0.75 ( $3/4 = 0.75$ ). The remaining group dealing with Price Competition has six statements, and therefore the combined score of the six statement is multiplied by a factor of 0.5 ( $3/6 = 0.5$ ) to get the weighted score.

**4.4 Research Limitations**

There are two main limitations of this research both relating to the fact that the questionnaire had been posted to the sample group. Firstly control is lost over who completes the actual questionnaire as it is done so without the supervision of the researcher. This could result in questionnaires being completed by a person that is perhaps not in the best position to answer

the questions posed. Secondly postal surveys generally have a fairly low rate of return. In this case 32% of questionnaires were returned by the deadline date. A further 6 questionnaires making up 4% were returned after the data analysis had been completed and have therefore have been excluded from the research.

In conclusion the research design and analysis has been carefully considered to adhere to the principles of reliability and validity. The style of presentation selected hopes to create a clear picture in the mind of the reader after all the common adage goes – a picture is worth a thousand words. With the methodology explained and the limitations acknowledged a look at the findings follows.

## Chapter 5

### Findings

The findings from the research conducted are presented in this chapter. Findings summarised across all districts are presented first, followed by a district by district comparison in which identified similarities are been highlighted. In order to present a clear picture the findings are presented in a visual format, namely graphs and frequency tabled.

The selected sample consisted of the 150 biggest committed timber growing members in terms of Eucalyptus supply potential across the four major catchments of the NCT strategic markets in Richards Bay and Durban. These catchments are described as Greytown, Northern Natal, Zululand and Southern Natal.

#### 5.1. Sample Profile

A detailed profile of the sample follows:

##### Number of questionnaires sent per district:

Greytown district:	15 (10%)
Northern Natal district:	59 (39%)
Southern Natal district:	57 (38%)
Zululand district:	19 (13%)

<b>Total number of questionnaires sent out:</b>	<b>150</b>
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##### Number of questionnaires received per district:

Number of questionnaires received from Greytown:	4 (27%)
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Number of questionnaires received from Northern Natal:	15 (25%)
Number of questionnaires received from Southern Natal:	25 (44%)
Number of questionnaires received from Zululand:	4 (21%)

**Total number of questionnaires received: 48 (32%)**

Number of spoiled or unanswered questionnaires received: 3

Percentage of members represented by the respondents per district:

Number of questionnaires received from Greytown:	13%
Number of questionnaires received from Northern Natal:	16%
Number of questionnaires received from Southern Natal:	23%
Number of questionnaires received from Zululand:	10%

## **5.2. Results – All District**

A tabled summary of the results from the respondents representing 17% of NCT Class 1 Eucalyptus suppliers and 32% of respondents, across all the districts, can be found in Appendix C. In section 5.2.1 below a frequency table showing the results across all districts is presented followed by an in depth discussion of these results.

### **5.2.1. Discussion of All District results**

The following table shows a summary of the statements ranked from highest (largest impact) to lowest (least or no impact).

**Table 5.1: All districts ranked average scores from highest to lowest impact.**

<b>All Districts Average Scores ranked from highest scoring statements to lowest.</b>		
<b>No</b>	<b>Statement</b>	<b>Impact</b>
14	At a mill delivered price of R230/ton I will stop/slow down harvesting and bank my timber.	53
4	A R20 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	40
10	My supplies to other non-pulpwood markets e.g. pole markets and special markets reduce my pulpwood available to NCT.	39
15	At a mill delivered price of R250/ton I will stop/slow down harvesting and bank my timber	36
7	Labour and/or contractor problems reduce my supplies.	34
3	A R10 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	29
6	My other farming activities reduce my timber supplies.	27
8	A lack of transport reduces my supplies.	23
9	The possible non-payment of commitment bonuses reduces my supply volumes.	20
2	A R5 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	16
16	At a mill delivered price of R270/ton I will stop/slow down harvesting and bank my timber	16
5	A lack of service from NCT reduces my supplies.	15
1	Supplies to other agents or buyers initiated in the last 24 months reduce my NCT supply volumes.	14
13	NCT systems and procedures have prompted me to reduce my NCT supplies.	8
17	At a mill delivered price of R290/ton I will stop/slow down harvesting and bank my timber	5
11	Recent investments made by NCT, in for example Durban Woodchips and Pulp United, has prompted me reduced my supplies to NCT.	3
12	The fact that NCT as a co-operative has not converted to a company has prompted me to reduce my NCT supplies.	2
	Total	22

Overall members indicated that out of all factors listed the banking of timber at R230/ton is the factor that is most likely to affect their supplies, followed by selling to the competition, non-pulpwood markets, labour and contractor problems, other farming activities, lack of transport, non payment of commitment bonuses, lack of service from NCT, NCT systems and

procedures, recent investments made by the co-operative and lastly the fact that NCT has not converted from a co-operative to a company.

The graph below shows the impact of the statements listed in the questionnaire in relation to one another in a visual format, reiterating the analysis above. Statement numbers with a nil value have been removed from the graph for ease of reading.

**Diagram 5.1: Statements impacting on All Districts' supply volumes.**

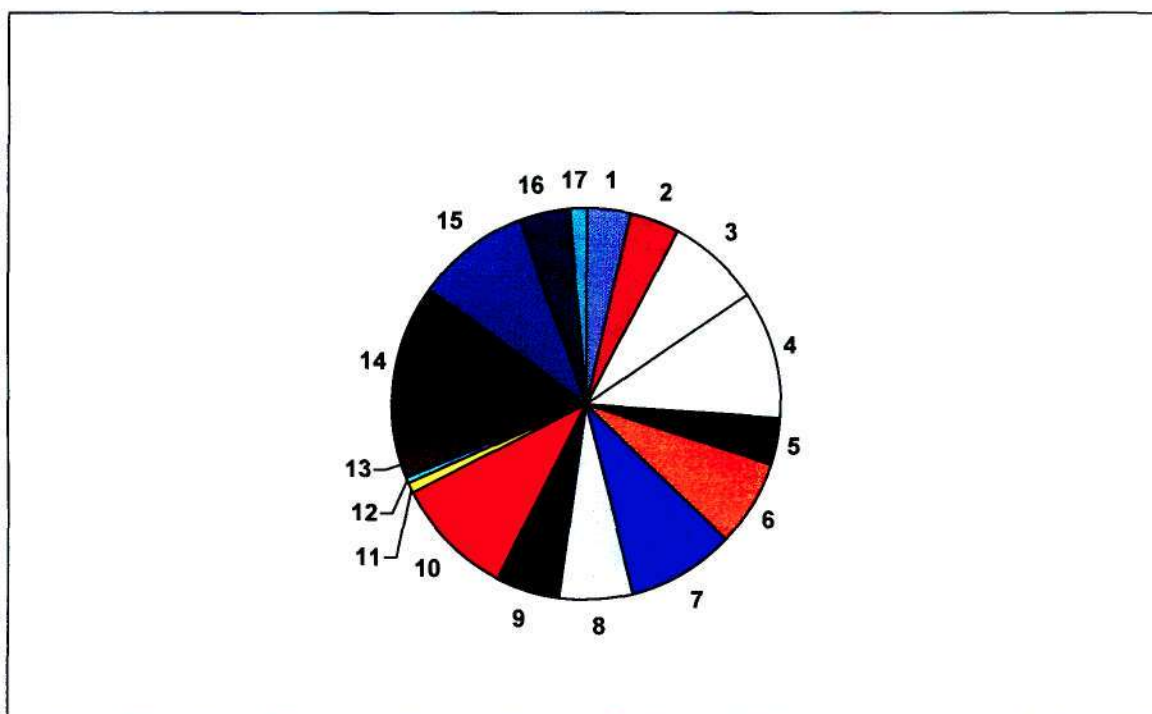
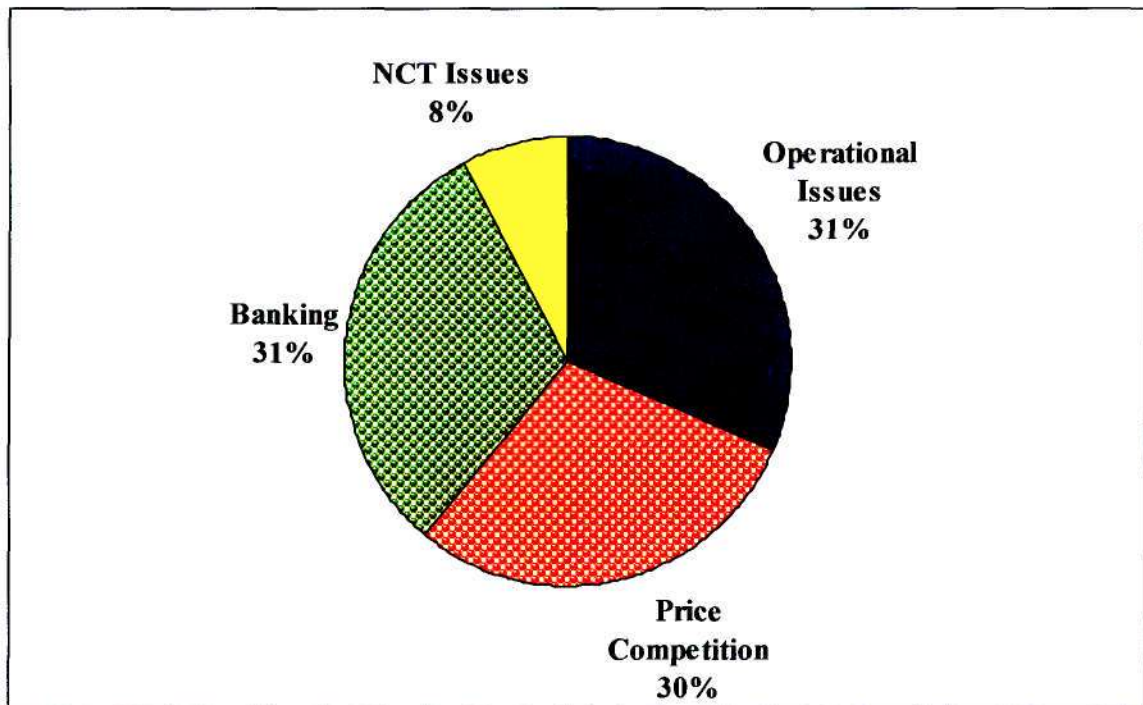


Diagram 5.2, has been designed to assist with a broader interpretation of the impact of the various issues listed on supply. In this diagram the 17 statements have been grouped into four topics and have been allocated a weighted percentage. Two of the topics namely price competition and banking relate in one way or another to the sensitivity of suppliers to price and economical circumstances. In order to see the combined impact of these two topics, or in other words the impact of the economy, the areas in the chart relating to these have been shaded with a bubble pattern.

**Diagram 5.2: Impact of grouped statements on all districts' supply volumes.**



The data in this graph fits the graphs of Northern and Southern Natal best, in that it mirrors the combined impact of price competition and banking in these two districts, as well as the operational impact. Banking, price competition and operational issues are on par with each other.

In order to identify the area of focus required per district the following table sets out each of the 17 statements with each of the four districts weighted scores. The highest score per statement has been highlighted in orange, indicating the district that is most sensitive to the specific issue.



**Table 5.2: Weighted scores across all Districts and all statements**

No	Statement	Greytown	N-Natal	S-Natal	Zululand
1	Supplies to other agents or buyers initiated in the last 24 months reduce my NCT supply volumes.	0	17	15	6
2	A R5 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	0	25	15	0
3	A R10 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	0	35	30	25
4	A R20 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	35	53	46	38
5	A lack of service from NCT reduces my supplies.	0	20	14	13
6	My other farming activities reduce my timber supplies.	38	22	25	50
7	Labour and/or contractor problems reduce my supplies.	44	33	33	31
8	A lack of transport reduces my supplies.	31	20	24	19
9	The possible non-payment of commitment bonuses reduces my supply volumes.	6	28	18	13
10	My supplies to other non-pulpwood markets e.g. pole markets and special markets reduce my pulpwood available to NCT.	38	28	47	13
11	Recent investments made by NCT, in for example Durban Woodchips and Pulp United, has prompted me reduced my supplies to NCT.	0	5	3	0
12	The fact that NCT as a co-operative has not converted to a company has prompted me to reduce my NCT supplies.	0	7	0	0
13	NCT systems and procedures have prompted me to reduce my NCT supplies.	0	7	12	0
14	At a mill delivered price of R230/ton I will stop/slow down harvesting and bank my timber.	25	65	53	31
15	At a mill delivered price of R250/ton I will stop/slow down harvesting and bank my timber	6	50	37	6
16	At a mill delivered price of R270/ton I will stop/slow down harvesting and bank my timber	0	20	17	0
17	At a mill delivered price of R290/ton I will stop/slow down harvesting and bank my timber	0	8	4	0

In each instance the highest score has been highlighted per statement. In the table above the highest number of highlighted blocks fall below the Northern Natal heading, indicating that this district is the affected by more of the statements than any of the other districts sampled. Northern Natal scored the highest score for 12 out of the 17 statements.

### **5.3. Results – Greytown District**

A tabled summary of the results from the respondents representing 13% of the Greytown district can be found in Appendix D. In section 5.3.1 below a frequency table showing the results across the Greytown district is presented followed by an in depth discussion of these results.

#### **5.3.1. Discussion of Greytown District results**

Table 5.3 below shows a summary of the statements ranked from highest (largest impact) to lowest (least or no impact).

**Table 5.3: Greytown District ranked average scores**

<b>Greytown District Average Scores ranked from highest scoring statements to lowest.</b>		
<b>No</b>	<b>Statement</b>	<b>Impact</b>
7	Labour and/or contractor problems reduce my supplies.	44
6	My other farming activities reduce my timber supplies.	38
10	My supplies to other non-pulpwood markets e.g. pole markets and special markets reduce my pulpwood available to NCT.	38
8	A lack of transport reduces my supplies.	31
14	At a mill delivered price of R230/ton I will stop/slow down harvesting and bank my timber.	25
4	A R20 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	19
9	The possible non-payment of commitment bonuses reduces my supply volumes.	6
15	At a mill delivered price of R250/ton I will stop/slow down harvesting and bank my timber	6
1	Supplies to other agents or buyers initiated in the last 24 months reduce my NCT supply volumes.	0
2	A R5 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	0
3	A R10 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	0
5	A lack of service from NCT reduces my supplies.	0
11	Recent investments made by NCT, in for example Durban Woodchips and Pulp United, has prompted me reduced my supplies to NCT.	0
12	The fact that NCT as a co-operative has not converted to a company has prompted me to reduce my NCT supplies.	0
13	NCT systems and procedures have prompted me to reduce my NCT supplies.	0
16	At a mill delivered price of R270/ton I will stop/slow down harvesting and bank my timber	0
17	At a mill delivered price of R290/ton I will stop/slow down harvesting and bank my timber	0
	<b>Total Average</b>	<b>12</b>

In this district statement 7 “Labour and or Contractor problems reduce my supplies” scored the highest. The assumption can be made that this factor has the biggest impact on suppliers from this area.

Statement 6 “My other farming activities reduce my supplies” and statement 10 “My supplies to other non-pulpwood markets e.g. pole markets and special markets reduce my pulpwood available to NCT” scored next highest, therefore having the next biggest impact on supplies. Suppliers in this area only rated the effect a low price has on their supply after labour problems, other farming activities, special markets and transport problems.

At a price of R230/ton (statement 14) members indicated that they would bank their timber, however statement 4 dealing with a R20 decrease in price compared to other buyers was rated very close to statement 14, with not much in it, the assumption can be made that members would bank their timber or equally easily break their commitment agreements and supply to other buyers when prices are as low as R230/ton or when there is a R20/ton price differential.

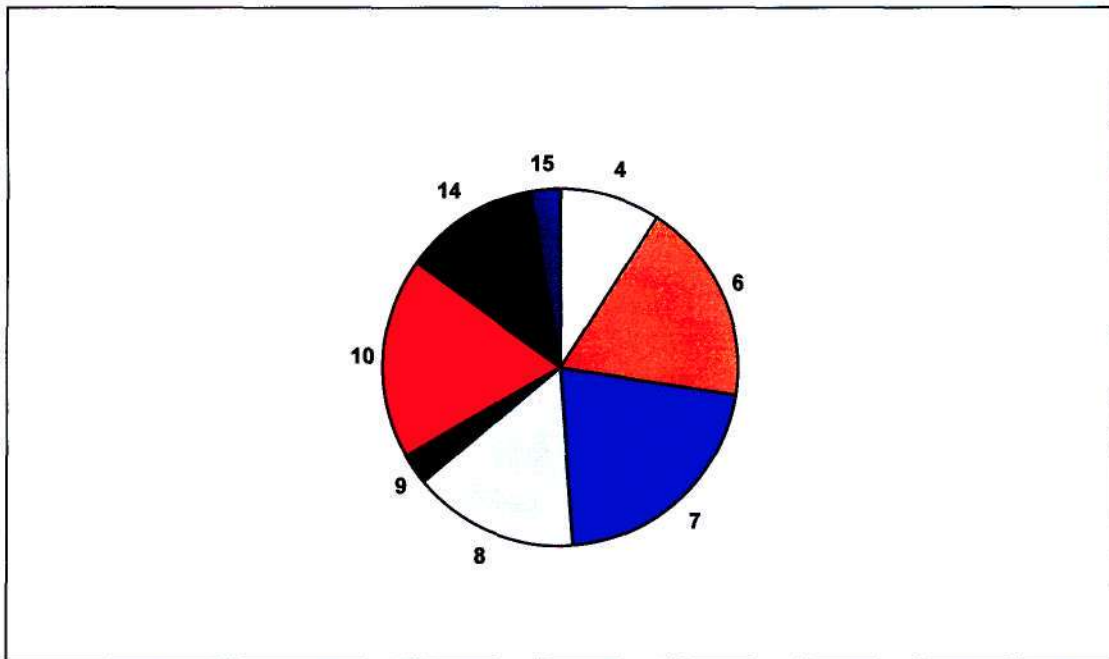
Both statement 14 and 4 scored relatively low scores in comparison to other districts, indicating that in comparison to some of the other districts members from Greytown are less price sensitive, however both statements scored above the average score of 12 and therefore still have a impact. The same applies to statement 9 and 15, both dealing with price and banking.

The remaining statements all scored 0 indicating that they almost never impact on supply. Overall the statements listed scored an average score of 12, the lowest score out of all the districts indicating that suppliers from the Greytown area are least affected by the issues listed in the questionnaire and hence can be considered as the most reliable suppliers.

The graph below shows the impact of the statements listed in the questionnaire in relation to one another in a visual format, reiterating the analysis above. Statement numbers with a nil value have been removed from the graph for ease of reading.



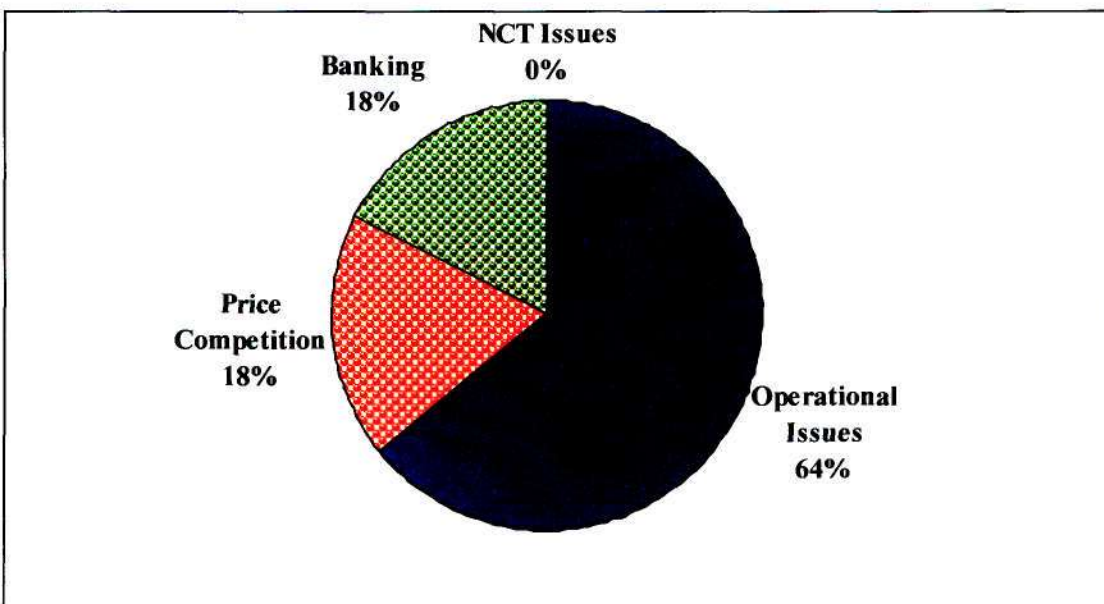
**Diagram 5.3: Statements impacting on the Greytown District supply volumes**



As can be seen from the graph statements 6, 7, 8 and 14 play a role in reducing the volume of eucalyptus timber supplied from this district.

The graph below shows the impact of the statements listed in the questionnaire in relation to one another, grouped by topic, in order to provide a clear picture of the grouped topics that impact most on supplies.

**Diagram 5.4: Impact of grouped statements on Greytown supply volumes.**



From this diagram it is clear that operational issues have the biggest impact on the flow of timber from the Greytown district. Interestingly this is the only district that indicated that NCT related issues such as service, systems, investments and the co-op structure has had no effect on their supplies indicating that this district is completely happy with the way NCT is conducting its business at present.

The Greytown, and Zululand districts are the only two that rated the impact of economical issues such as price and banking of timber at less than 50% in comparison to the other two topics. Both Northern and Southern Natal attributed reduced supplies more to price and banking than to other issues. Greytown is also the only district that scored the same in price competition as it did on banking, indicating that member would just as easily sell to the competition as they would bank their timber.

For NCT, a member selling to the competition is more of a threat than a member banking timber as in the case of the latter the timber is still available to NCT at a later stage, in contrast timber sold to a competitor is forever lost to NCT.

#### **5.4. Results – Northern Natal District**

A tabled summary of the results from the respondents representing 16% of the Northern Natal district can be found in Appendix E. In section 5.4.1 below a frequency table showing the results across the Northern Natal district is presented followed by an in depth discussion of these results.

##### **5.4.1. Discussion of Northern Natal District results**

The following table shows a summary of the statements ranked from highest (largest impact) to lowest (least or no impact).

**Table 5.4: Northern Natal district ranked average scores**

Northern Natal District Average Scores ranked from highest scoring statements to lowest.		
No	Statement	Impact
14	At a mill delivered price of R230/ton I will stop/slow down harvesting and bank my timber.	65
4	A R20 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	53
15	At a mill delivered price of R250/ton I will stop/slow down harvesting and bank my timber	50
3	A R10 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	35
7	Labour and/or contractor problems reduce my supplies.	33
9	The possible non-payment of commitment bonuses reduces my supply volumes.	28
10	My supplies to other non-pulpwood markets e.g. pole markets and special markets reduce my pulpwood available to NCT.	28
2	A R5 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	25
6	My other farming activities reduce my timber supplies.	22
5	A lack of service from NCT reduces my supplies.	20
8	A lack of transport reduces my supplies.	20
16	At a mill delivered price of R270/ton I will stop/slow down harvesting and bank my timber	20
1	Supplies to other agents or buyers initiated in the last 24 months reduce my NCT supply volumes.	17
17	At a mill delivered price of R290/ton I will stop/slow down harvesting and bank my timber	8
12	The fact that NCT as a co-operative has not converted to a company has prompted me to reduce my NCT supplies.	7
13	NCT systems and procedures have prompted me to reduce my NCT supplies.	7
11	Recent investments made by NCT, in for example Durban Woodchips and Pulp United, has prompted me reduced my supplies to NCT.	5
	Total Average	26

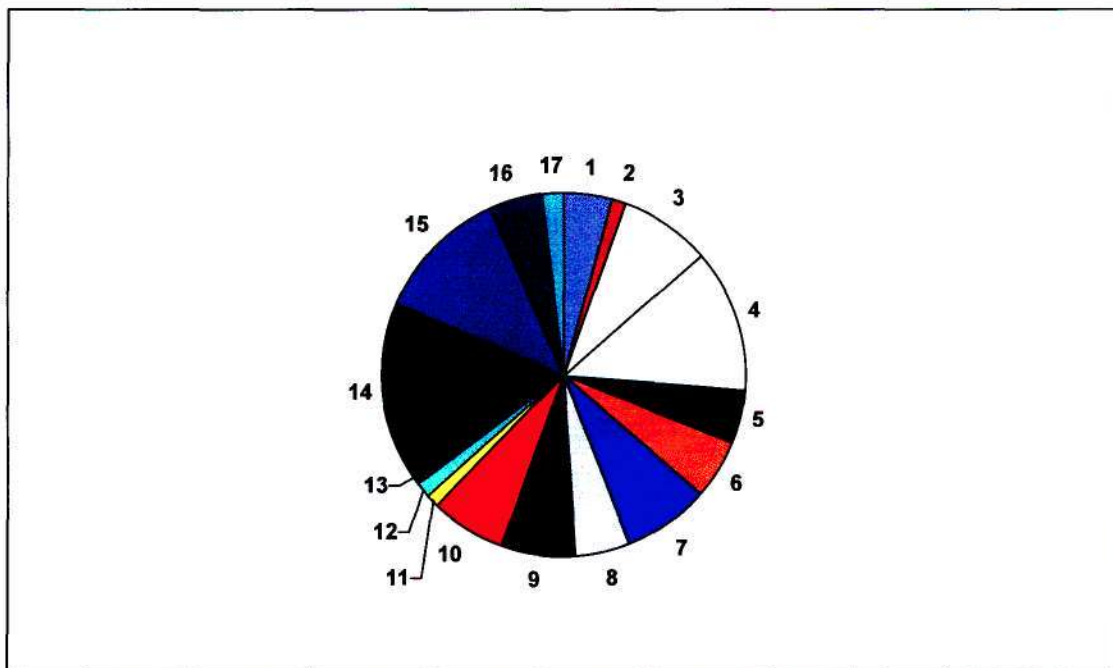
This district scored the highest average score at 26, indicating that out of the four districts in the sample group the statements listed in the questionnaire impacted the most on suppliers

from this group. Statements 14, 4, 15, and 3 scored the highest, all four dealing with the issue of banking and supplying to other buyers when NCT prices are low.

This contrasts with the Greytown results where supplies were more heavily affected by operational problems. Statement 7 relating to contractor and labour problems also scored relatively high at 33. As did statements 9, possible non-payment of commitment bonuses and 10, supplies to other non-pulpwood markets both scoring an above average 28. Northern Natal suppliers indicated that the main factors affecting their supplies relate to banking of timber and the impact of selling to other buyers. The factors least affecting supplies are statements 11, relating to recent investments made by NCT, 13, relating to the NCT systems and 12, relating to the fact that NCT has not converted to a company.

The graph below shows the impact of the statements listed in the questionnaire in relation to one another in a visual format, reiterating the analysis above. Statement numbers with a nil value have been removed from the graph for ease of reading.

**Diagram 5.5: Statements impacting on Northern Natal District supply volumes.**

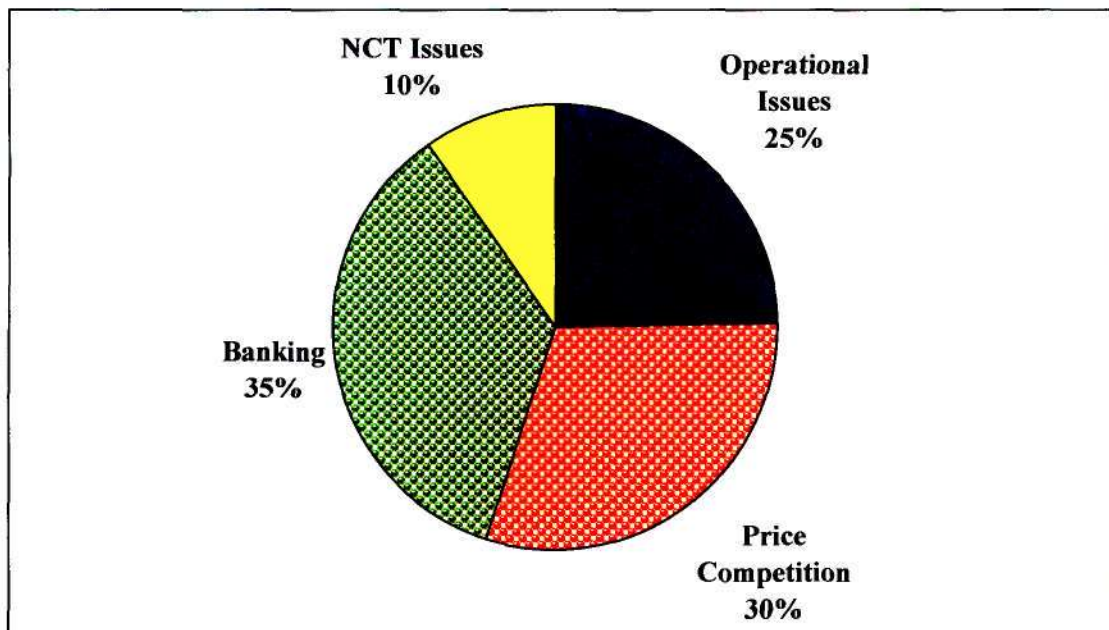




Looking at the data in this format we can clearly see the impact of statements 14, banking at R230/ton, 15, banking at R250/ton and 4, a R20 per ton price decrease comparative to competitors.

The graph below shows the impact of the statements listed in the questionnaire in relation to one another, grouped by topic, in order to provide a clear picture of the grouped topics that impact most on supplies.

**Diagram 5.6: Impact of grouped statements on Northern Natal supply volumes.**



The above diagram shows the impact of price and banking due to low prices, on supplies in this area. Combined the two topics account for a 65% influence on supply. Operational issues account for a 25% impact. This result is inverse to the result from the Greytown members where operational issues accounted for 64% and price and banking for 26%. This is the only district that scored more on banking as opposed to price competition albeit by 5%. One other district, that of Greytown scored equally on price and banking, and both Southern Natal and Zululand scored higher on price competition than on banking.

### 5.5. Results – Southern Natal District

A tabled summary of the results from the respondents representing 23% of the Southern Natal district can be found in Appendix F. In section 5.5.1 below a frequency table showing the

results across the Southern Natal district is presented followed by an in depth discussion of these results.

### 5.5.1. Discussion of Southern Natal District results

The following table shows a summary of the statements ranked from highest (largest impact) to lowest (least or no impact).

**Table 5.5: Southern Natal district ranked average scores**

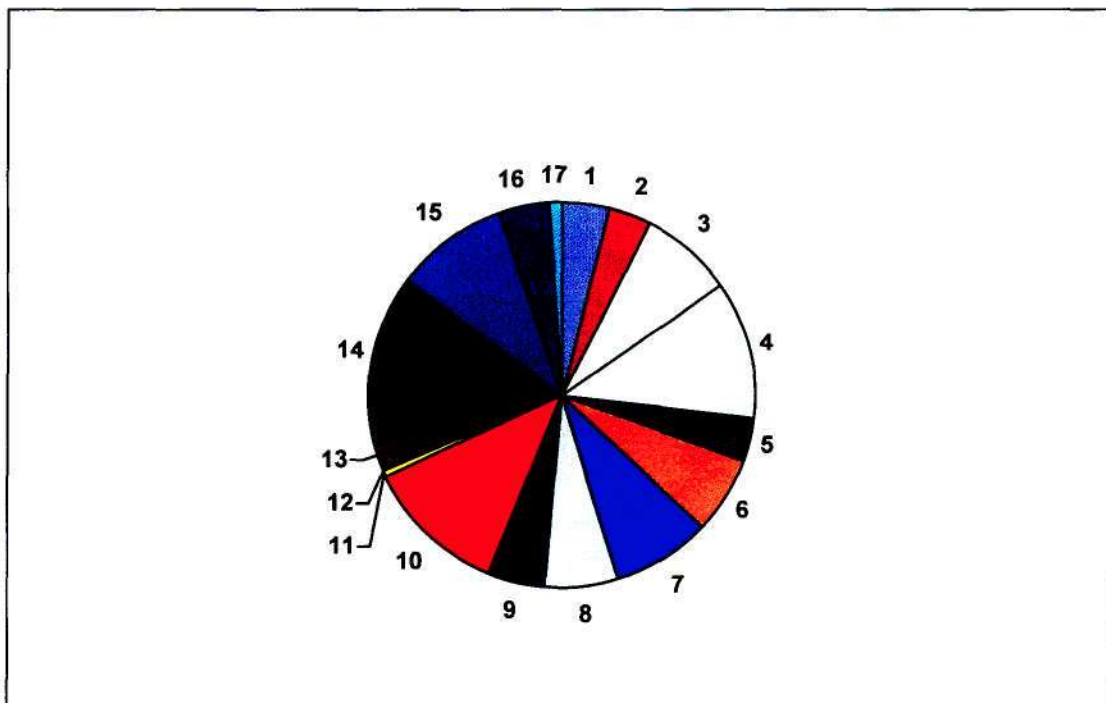
<b>Southern Natal District Average Scores ranked from highest scoring statements to lowest.</b>		
<b>No</b>	<b>Statement</b>	<b>Impact</b>
14	At a mill delivered price of R230/ton I will stop/slow down harvesting and bank my timber.	53
10	My supplies to other non-pulpwood markets e.g. pole markets and special markets reduce my pulpwood available to NCT.	47
4	A R20 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	46
15	At a mill delivered price of R250/ton I will stop/slow down harvesting and bank my timber	37
7	Labour and/or contractor problems reduce my supplies.	33
3	A R10 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	30
6	My other farming activities reduce my timber supplies.	25
8	A lack of transport reduces my supplies.	24
9	The possible non-payment of commitment bonuses reduces my supply volumes.	18
16	At a mill delivered price of R270/ton I will stop/slow down harvesting and bank my timber	17
1	Supplies to other agents or buyers initiated in the last 24 months reduce my NCT supply volumes.	15
2	A R5 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	15
5	A lack of service from NCT reduces my supplies.	14
13	NCT systems and procedures have prompted me to reduce my NCT supplies.	12
17	At a mill delivered price of R290/ton I will stop/slow down harvesting and bank my timber	4
11	Recent investments made by NCT, in for example Durban Woodchips and Pulp United, has prompted me reduced my supplies to NCT.	3
12	The fact that NCT as a co-operative has not converted to a company has prompted me to reduce my NCT supplies.	0
	<b>Total Average</b>	<b>23</b>



This district scored the second highest average score indicating that next to Northern Natal the factors listed in the questionnaire affect supplies from this area most. Factors having the biggest impact include banking timber due to low prices, supplies to pole markets and other non pulpwood markets and supplies to other buyers should their be a R20/ton price differential. Factors having least impact relate to the fact that NCT has remained a co-op and has not converted to a company, recent investments by NCT and banking at a price of R290/ton. As in the case of Northern Natal, this district's supplies are affected by competition and banking more than operational issues. The statement dealing with labour and or contractor problem did however score an above average score of 46 indicating that this factor does also have an effect on supplies.

The graph below shows the impact of the statements listed in the questionnaire in relation to one another in a visual format, reiterating the analysis above. Statement numbers with a nil value have been removed from the graph for ease of reading.

**Diagram 5.7: Statements impacting on the Southern Natal district supply volumes.**



Looking at the data in this format we see that statements 14, 4, 10 and 15 have the biggest impact on supplies all of them dealing with price and banking. A number of other statements have some or other impact on supply.

The graph below shows the impact of the statements listed in the questionnaire in relation to one another, grouped by topic, in order to provide a clear picture of the grouped topics that impact most on supplies.

**Diagram 5.8: Impact of grouped statements on Southern Natal supply volumes.**

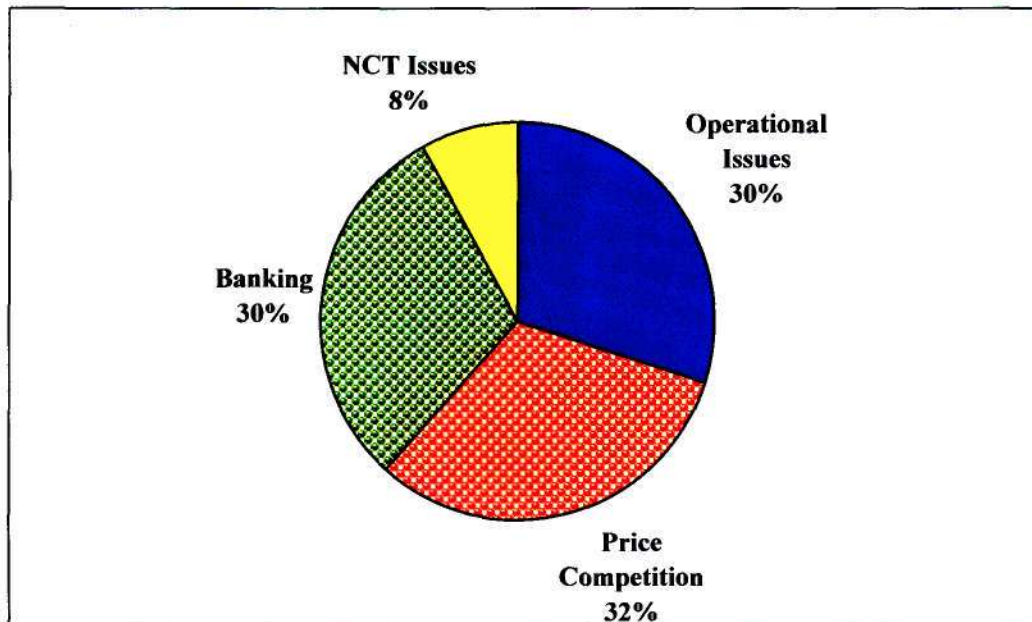


Diagram 5.8 shows a similar pattern to that of diagram 5.6 dealing with the impact of grouped statements on Northern Natal in that the majority of impact stems from price and banking issues. Northern Natal scored a 65% combined score for price and banking and Southern Natal, as can be seen above, scores 62%. Similarly operational issues score 30% here for Southern Natal and 25% in the Northern Natal results. It appears that these two districts are closely related in the issues that affect them.

## 5.6 Results – Zululand District

A tabled summary of the results from the respondents representing 10% of the Zululand district can be found in Appendix G. In section 5.6.1 below a frequency table showing the results across the Zululand district is presented followed by an in depth discussion of these results.



### 5.6.1. Discussion of Zululand District results

The following table shows a summary of the statements ranked from highest (largest impact) to lowest (least or no impact).

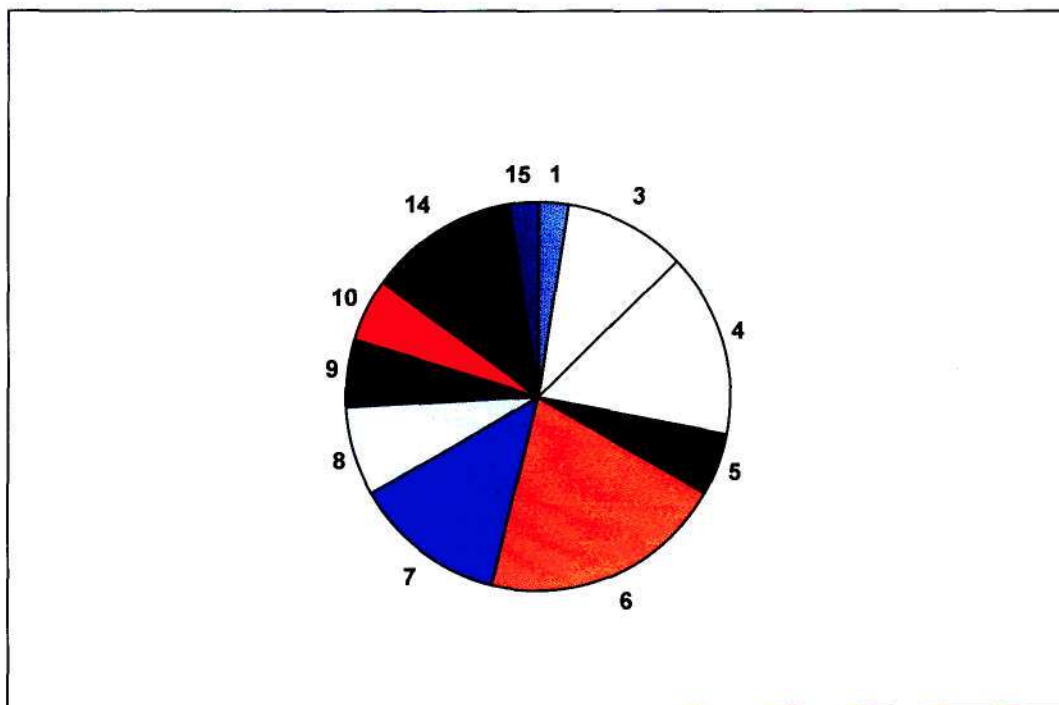
**Table 5.6: Zululand district ranked average scores**

<b>Zululand District Average Scores ranked from highest scoring statements to lowest.</b>		
<b>No</b>	<b>Statement</b>	<b>Impact</b>
6	My other farming activities reduce my timber supplies.	50
4	A R20 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	38
14	At a mill delivered price of R230/ton I will stop/slow down harvesting and bank my timber.	31
7	Labour and/or contractor problems reduce my supplies.	31
3	A R10 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	25
8	A lack of transport reduces my supplies.	19
5	A lack of service from NCT reduces my supplies.	13
9	The possible non-payment of commitment bonuses reduces my supply volumes.	13
10	My supplies to other non-pulpwood markets e.g. pole markets and special markets reduce my pulpwood available to NCT.	13
1	Supplies to other agents or buyers initiated in the last 24 months reduce my NCT supply volumes.	6
15	At a mill delivered price of R250/ton I will stop/slow down harvesting and bank my timber	6
2	A R5 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	0
11	Recent investments made by NCT, in for example Durban Woodchips and Pulp United, has prompted me reduced my supplies to NCT.	0
12	The fact that NCT as a co-operative has not converted to a company has prompted me to reduce my NCT supplies.	0
13	NCT systems and procedures have prompted me to reduce my NCT supplies.	0
16	At a mill delivered price of R270/ton I will stop/slow down harvesting and bank my timber	0
17	At a mill delivered price of R290/ton I will stop/slow down harvesting and bank my timber	0
	<b>Total Average</b>	<b>14</b>

As in the case of Greytown, the Zululand district compared to Northern and Southern Natal is overall affected to a lesser degree by the factors listed in the questionnaire. This district scores an average score of 14. Statement 6, my other farming activities scored the highest out of the statements, followed by statements 4 and 14 dealing with price and banking and statement 7 relating to labour and contractors problems.

The graph below shows the impact of the statements listed in the questionnaire in relation to one another in a visual format, reiterating the analysis above. Statement numbers with a nil value have been removed from the graph for ease of reading.

**Diagram 5.9: Statements impacting on the Zululand district supply volumes.**



Note the impact of statements 6, 4, 7, 14 and 3. Once again any statements scoring nil have been removed from the graph for ease of reading.

The graph below shows the impact of the statements listed in the questionnaire in relation to one another, grouped by topic, in order to provide a clear picture of the grouped topics that impact most on supplies.

**Diagram 5.10: Impact of grouped statements on Zululand supply volumes.**

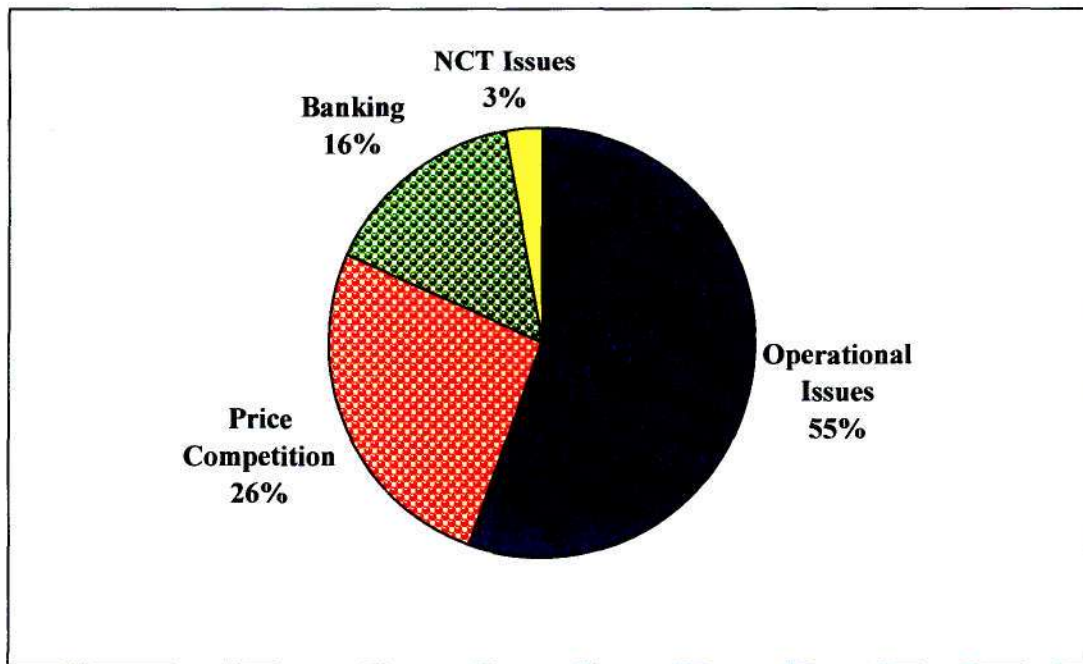


Diagram 5.10 clearly show the biggest impact, as suspected, coming from operational issues, 55%, this is similar to Greytown's 64%, if somewhat less. Banking and price make up a combined impact of 42%. In all three the other districts there is not much in it between the score allocated to banking and price competition.

In the Zululand district the score difference between price and banking is 10%, the biggest variance out of all the districts, making this the only district that will clearly rather sell their timber to the competition than bank it, however as price competition plays a comparatively small role they are unlikely to pursue either avenue.

In summary there are clear similarities between the results from the Greytown and the Zululand districts. Similarly similarities exist between the Southern and Northern Natal districts. For the aforementioned district operational issues are the main constraints in the system and for the latter price related issues make up the main constraints to supplies.

This concludes the findings chapter. In the next chapter conclusions from the findings are presented.

## Chapter 6

### Conclusions

In this chapter the conclusions drawn from the findings in the previous chapter are presented structured by the research objectives presented earlier in the report.

#### 6.1 Identifying the variables that impact on the supply of Eucalyptus pulpwood timber.

The table below lists the statements that scored 5% and higher in terms of impact across all districts. In line with the Theory of Constraints (TOC) and as highlighted by Ahmed (2005, p26) the variables below have been identified by the customers, in this case NCT members as those that they value and therefore focus should be relieving constraints relating to these variables. From here the conclusion can be drawn that these statement relate to the variables that impact most on the supply of eucalyptus pulpwood.

**Table 6.1: The variables that impact on the supply of Eucalyptus pulpwood timber.**

No	Statement	Ave. Score	% Score
14	At a mill delivered price of R230/ton I will stop/slow down harvesting and bank my timber.	53	14
4	A R20 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	40	11
10	My supplies to other non-pulpwood markets e.g. pole markets and special markets reduce my pulpwood available to NCT.	39	10
15	At a mill delivered price of R250/ton I will stop/slow down harvesting and bank my timber	36	9
7	Labour and/or contractor problems reduce my supplies.	34	9
6	My other farming activities reduce my timber supplies.	29	8
3	A R10 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	27	7
8	A lack of transport reduces my supplies.	23	6
9	The possible non-payment of commitment bonuses reduces my supply volumes.	20	5

Price related issues as well as operational issues such as labour, contractor and transport problems have the biggest impact on supplies. Focus is required on these issues in order to improve supplies.



## 6.2. Quantifying the impact of the main variables on supplies.

In this section a percentage score was allocated to each of the variables in order to be able to quantify the impact of the variables on supplies.

To quantify the impact of the variables listed, each variable was firstly allocated a percentage value. The percentage was allocated by adding up all the average scores to get a total score.

Each statements score was then divided by the total score to get the percentage score. For example the sum of all the average scores is 380, therefore to get the percentage score for statement 14, divide its score of 53 by the total of 380. The answer is 14%. The table below list's each of the variables with the average and percentage score ranked from highest to lowest.

**Table 6.2: The Percentage Impact of the main variables on supplies**

No	Statements	Ave. Score	%
14	At a mill delivered price of R230/ton I will stop/slow down harvesting and bank my timber.	53	14
4	A R20 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	40	11
10	My supplies to other non-pulpwood markets e.g. pole markets and special markets reduce my pulpwood available to NCT.	39	10
15	At a mill delivered price of R250/ton I will stop/slow down harvesting and bank my timber	36	9
7	Labour and/or contractor problems reduce my supplies.	34	9
6	My other farming activities reduce my timber supplies.	29	8
3	A R10 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	27	7
8	A lack of transport reduces my supplies.	23	6
9	The possible non-payment of commitment bonuses reduces my supply volumes.	20	5
2	A R5 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	16	4
16	At a mill delivered price of R270/ton I will stop/slow down harvesting and bank my timber	16	4
5	A lack of service from NCT reduces my supplies.	15	4
1	Supplies to other agents or buyers initiated in the last 24 months reduce my NCT supply volumes.	14	4
13	NCT systems and procedures have prompted me to reduce my NCT supplies.	8	2
17	At a mill delivered price of R290/ton I will stop/slow down harvesting and bank my timber	5	1
11	Recent investments made by NCT, in for example Durban Woodchips and Pulp United, has prompted me reduced my supplies to NCT.	3	1
12	The fact that NCT as a co-operative has not converted to a company has prompted me to reduce my NCT supplies.	2	1
<b>TOTALS</b>		<b>380</b>	<b>100</b>

### 6.3 Weighting the identified variables according to the significance of their impact on supplies.

Organisations often face many problems, the TOC recommends that core problems be dealt with first in order to improve the performance of the organisation (Hsu & Sun, 2005, paragraph 43). In line with this theory the table below summarises the statements and their average scores ranked from highest score indicating the biggest impact on supplies to the lowest score indicating the least impact. It is recommended that the issue listed in the statement at the top of the table be addressed first before moving on to solving the next issue.

**Table 6.3: The variables that impact on supply, weighted and ranked**

No	Statement	Average Score
14	At a mill delivered price of R230/ton I will stop/slow down harvesting and bank my timber.	53
4	A R20 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	40
10	My supplies to other non-pulpwood markets e.g. pole markets and special markets reduce my pulpwood available to NCT.	39
15	At a mill delivered price of R250/ton I will stop/slow down harvesting and bank my timber	36
7	Labour and/or contractor problems reduce my supplies.	34
6	My other farming activities reduce my timber supplies.	29
3	A R10 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	27
8	A lack of transport reduces my supplies.	23
9	The possible non-payment of commitment bonuses reduces my supply volumes.	20
2	A R5 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	16
16	At a mill delivered price of R270/ton I will stop/slow down harvesting and bank my timber	16
5	A lack of service from NCT reduces my supplies.	15
1	Supplies to other agents or buyers initiated in the last 24 months reduce my NCT supply volumes.	14
13	NCT systems and procedures have prompted me to reduce my NCT supplies.	8
17	At a mill delivered price of R290/ton I will stop/slow down harvesting and bank my timber	5
11	Recent investments made by NCT, in for example Durban Woodchips and Pulp United, has prompted me reduced my supplies to NCT.	3
12	The fact that NCT as a co-operative has not converted to a company has prompted me to reduce my NCT supplies.	2



The first four statements relate to price followed by two statements dealing with operational constraints, followed by a mix of statements. Looking at the variables through the eyes of the supplier as Patrick (1996, paragraph 10) suggested it is clear that price is the variable that affects timber supply volumes the most. Unfortunately it is often hard or even impossible for an organisation to change price as it is determined by market factors out of its control. Again a principle from the TOC can be called upon to assist. According to the TOC it is not always best practice or possible to address every constraint, however improvement can be obtained by optimising a variety of factors in order to improve the overall results (Ahmed 2005, p26). Applying this to NCT, price related issues could be addressed by applying creative thinking to ease supplier sensitivity in ways not directly related to a price paid per ton.

#### 6.4 Identifying any similarities between the four districts with regards to issues affecting supply.

In order to determine whether the four districts in the survey have any issues in common and if so which ones, the table below identifies all statements that were ranked in the same position in more than one district.

**Table 6.4: Average Score Correlation Across Districts – Highlighting Similarities.**

Average Score Correlation Across Districts																	
Statement	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Greytown Position	9	10	11	6	12	2	1	4	7	3	13	14	15	5	8	16	17
Northern Natal Position	13	8	4	2	10	9	5	11	6	7	17	15	16	1	3	12	14
Southern Natal Position	11	12	6	3	13	7	5	8	9	2	16	17	14	1	4	10	15
Zululand Position	10	12	5	2	7	1	3	6	8	9	13	14	15	4	11	16	17

As can be see in Table 6.4 when looking at each statement individually there is almost no correlation between how districts ranked these. The Greytown and Zululand district has the highest correlation with 4 statements ranked in the same position. Both Northern and

Southern Natal has no correlation with Greytown. Northern and Southern Natal have the next highest correlation of 2. The Zululand district has the highest number of statements relating to any of the other districts namely 6.

**Table 6.5: Average Score Correlation Across Districts by Topic – Highlighting Similarities.**

<b>Average Score Correlation Across Districts by Topic</b>				
<b>Topic</b>	<b>Price Competition</b>	<b>NCT Issues</b>	<b>Operational Issues</b>	<b>Banking</b>
<b>Greytown Position</b>	0% - 24%	0% - 24%	50% - 74%	0% - 24%
<b>Northern Natal Position</b>	25% - 49%	0% - 24%	25% - 49%	25% - 49%
<b>Southern Natal Position</b>	25% - 49%	0% - 24%	25% - 49%	25% - 49%
<b>Zululand Position</b>	25% - 49%	0% - 24%	50% - 74%	0% - 24%

The table above shows that across all districts supply volumes are equally relatively unaffected by NCT issues, this is a topic that all four districts have in common. Further to this all districts other than Greytown have a similar problem with price competition affecting supplies. Greytown and Zululand districts face similar challenges with regards to operational and banking issues, as does Northern and Southern Natal.



## 6.5 Identifying differences between the four districts with regards to issues affecting supply.

**Table 6.6: Average Score Correlation Across Districts – Highlighting Differences.**

Average Score Correlation Across Districts																	
Statement	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Greytown Position	9	10	11	6	12	2	1	4	7	3	13	14	15	5	8	16	17
Northern Natal Position	13	8	4	2	10	9	5	11	6	7	17	15	16	1	3	12	14
Southern Natal Position	11	12	6	3	13	7	5	8	9	2	16	17	14	1	4	10	15
Zululand Position	10	12	5	2	7	1	3	6	8	9	13	14	15	4	11	16	17

The table above shows the differences across all districts. Looking at the data ungrouped as in this table and trying to make sense out of it is challenging. However as can be seen from Table 6.7 below, once the data is presented grouped by topic the picture becomes a lot clearer.

**Table 6.7: Average Score Correlation Across Districts by Topic – Highlighting Differences.**

Average Score Correlation Across Districts by Topic				
Topic	Price Competition	NCT Issues	Operational Issues	Banking
Greytown Position	0% - 24%	0% - 24%	50% - 74%	0% - 24%
Northern Natal Position	25% - 49%	0% - 24%	25% - 49%	25% - 49%
Southern Natal Position	25% - 49%	0% - 24%	25% - 49%	25% - 49%
Zululand Position	25% - 49%	0% - 24%	50% - 74%	0% - 24%

The table above highlights the differences by district by grouped topics. All the districts are similar in terms of their views on NCT Issues. The Greytown district is different from the remaining three districts in terms of it being less sensitive to price. Both the Greytown and Zululand districts are different to Northern and Southern Natal in terms of Banking and Operational Issues. When addressing these issues the differences and correlations should be kept in mind and strategies devised and rolled out accordingly.

## **6.6. Summary of Conclusions by District**

### **6.6.1 Greytown District**

In conclusion the Greytown district suppliers are, in comparison to the other districts, the least affected by the statements in the survey. In the event that supplies are reduced it is mainly as a result of operational problems. Greytown members will seldom bank or sell their timber to competitors, however should they do so changes are equal that they could banking or sell to the competition. Members in this district are relatively price insensitive.

This district is most similar to the Zululand district.

### **6.6.2 Northern Natal District**

In conclusion the Northern Natal district suppliers are the most affected by the statements in the survey. Supplies are mainly reduced as a result of members banking their timber and reducing volumes that are harvested. Price competition also has a impact on volume reduction in this district. Members in this district are relatively price sensitive. Some operational challenges exist here, however not as severely as in Zululand and Greytown districts.

This district is most similar to the Southern Natal district.

### **6.6.3 Southern Natal District**

In conclusion the Southern Natal district suppliers are the second most affected by the statements in the survey. Supplies are mainly reduced as a result of members reducing volumes when NCT prices are lower than that of the competitors. Banking of timber and reduced volumes that are harvested also have an impact, and equal to this is the impact of operational issues. This district faces a higher variety of challenges all round as price competition, banking and operational issues all have an equal impact in supplies. Members in this district are relatively price sensitive. This district is most similar to the Northern Natal district in term of sensitivity of price, however it shares similarities with the Greytown and Zululand districts with regards to the operational issues it faces.

### **6.6.4 Zululand District**

In conclusion the Zululand district suppliers are the second least affected by the statements in the survey. In the event that supplies are reduced it is mainly as a result of operational problems. Zululand members will seldom bank their timber, however they will sell timber to competitors, but this is less likely to happen in Zululand than in Northern and Southern Natal. However this is the only district that indicated that in the event of low prices they would rather sell timber to the competition than bank it. The other three districts all rated banking and or selling to the competition fairly equally. Zululand members are relatively price insensitive.

This district is most similar to the Greytown district.

## **Chapter 7**

### **Recommendations**

#### **7.1 Introduction**

The research analysis and conclusion sections have identified the variables that impact on supplies and from here a number of recommended actions are required in order to manage the impact of variable pulpwood supplies so that it has a minimal effect on an organisation. For ease of interpretation the recommendations sections are subdivided into general recommendations and district specific recommendations.

#### **7.2 Recommendations to NCT Forestry Co-operative Ltd.**

In each section recommendations have been divided into actions that should be started, continued and stopped.

##### **7.2.1 General Recommendations**

###### **7.2.1.1 Interventions required**

The following section deals with actions that need to be taken in order to address the supply constraints currently being experienced.

From the research it is evident that operational issues have an impact on supplies across the co-operative, therefore backwards vertical integration needs to be investigated as this could alleviate the labour, contractor and transport problems faced by members in this district. A feasible mechanised operation owned and managed by the co-operative needs to be

introduced. Swaine (2000) in a study for Mondi Forests found the following relevant advantages of a mechanised harvesting system:

- Production increase can be achieved with no extra input required.
- Production is significantly less influenced by climatic conditions.
- Output is not significantly influenced by bark stripability as is the case in manual operations.

On the other hand the risks associated with this method are as follows:

- Replacement cost of new machinery is dependant on the rand/dollar exchange rate at the time if the machinery is imported.
- The continued rise in the fuel price.
- Ineffective / incorrect management.

(Swaine, 2000)

A mechanised system applied correctly with the necessary expertise is a competitive alternative to manual harvesting operations.

Mechanised harvesting could offer a solution to the problems member's experience in terms of the stripability of timber as well as contractor and labour related problems.

The co-operative should embark on a formalised programme educating members on the possible synergies and efficiencies that can exist between different crops. Timber farming needs to be promoted as best as is possible in the mind of the farmer so that he views it as important as his other farming activities. Members need to fully understand the role that they play in the success or failure of the co-operative. This process should be facilitated by way of workshops and in house publications.

Members who have planting permits and suitable areas to plant timber must be encouraged to do so. The co-operative must insure that its resource is protected and managed in a sustainable manner. To encourage replanting discounted seedlings could be offered to members who replant within a designated period. Similarly this could apply to members who replant to a

recommended specie or genus and to those who plant new material after the recommended number of rotations.

A programme that identifies, analyses and addresses any inefficiencies in the NCT system in order to put the co-operative in a position to run as lean as possible in times when pulpwood prices are comparatively low thus allowing a bigger margin before a price reduction is also recommended. Methods need to be identified as to how to increase the members' profit margin making them less price sensitive and subsequently allowing the co-operative more room to breathe. An example could be the introduction of a central debarking unit, reducing the cost of harvesting for the members and increasing his net profit, mechanised harvesting as mentioned earlier could also reduce costs here. Another system that could relatively easily be introduced taking the current role players and stakeholders into consideration is introducing stump to mill contracts.

Stump to mill contracts reduce unnecessary inventory, and thus holding costs and theft, as well as reducing policing or management to settle disputes and co-ordinate delivery between harvester and transporter. The concept returns ownership to a single contractor whose focus is reducing delivered costs by optimising the process and not the individual task (Morkel, 2004, p16). This ties in with the process described in the theory of constraints whereby bottlenecks in production processes must be continually be identified and alleviated in order to streamline and maximise throughput ( Hsu and Sun, 2005, paragraph 19, 23).

In order to encourage members and suppliers to conduct business in a way favourable to the co-operative a loyalty reward programme can be introduced. An example of such a programme is Discovery Health's Vitality programme. By offering members access to services and products, at a reduced rate negotiated by the co-operative, positive behaviour is reinforced and the power of the co-operative's membership base is utilised to optimise benefits to individuals. This system could also be used to keep track of member performance, therefore when the good times arrive members that stuck with the co-operative in the bad times can be rewarded accordingly for their loyalty. This should motivate and encourage members to remain loyal to the co-operative in good times and bad.

It is further recommended that the co-operative looks at ways to value add, by knowing and understanding what members want value and expect from the co-operative. Profit is likely to

always be one of the most important issues in a supplier's life, however, in the variable economic environment that we find ourselves in it is important to have other quality and valued attractions as well. Offering assistance with for instance the claiming back of Skills Development Levies is a way of putting money back into the member's pocket without having to increase the timber price.

Lastly the co-operative needs to embark on a programme to educate members on the role that they play in the supply chain and of the importance of supply chain management. Members need to understand the impact of their actions up and down the supply chain and the effect that their actions have on all the role players. It is important that they are made aware that they do not exist in isolation to each other, but that their actions impact on each other and what effect that has. Awareness can be created by way of publications as well as workshops geared around this topic. Once all role players understand the concept of supply chain management and accept their own responsibility in ensuring the efficient management of the supply chain bottlenecks can be reduced increasing tonnes supplied, improving on the rateability of supplies and reducing costs throughout the supply chain.

#### **7.2.1.2 Actions to Continue**

The following section deals with actions that are currently in place and should continue.

- Providing members with non-pulpwood market options even though supplies to these markets do erode pulp volumes to a certain extent. By remaining involved here the co-operative can maintain member loyalty, interaction and member relations, showing members that it is indeed looking out for them in every possible way.
- Paying commitment bonuses as and when is possible. Most members indicated in the research that the non payment of commitment bonuses do not drastically affect their supplies to NCT, however the combination of relatively low prices and no commitment bonus does have a noticeable effect. If the co-operative can not out price its competitors it should aim to pay a token commitment bonus to those members who have supply in the tougher times as well. Unfortunately presently the big rewards

come to those who supply in times when it is in any case easy and obvious to supply timber through the co-op.

- Offering a reliable service to members. The good level of service from the co-operative to its members is vital especially in a tighter economic environment. When timber prices offered by the co-operative are higher than that of its competitors bad service would still be tolerated to a degree, however in times where prices offered for supply though the co-operative is not the best price upfront service levels become crucial.
- Using the current systems and procedures. From the research it is evident that the current systems and procedures used by NCT are not influencing the supply of timber in a negative manner and can therefore remain as is for the time being.

In conclusion it is recommended that the current practice of surveying members periodically to monitor their satisfaction with NCT related issues such as the level of service they receive and the systems and procedure used is continued. This is a useful tool for staying in touch with a dynamic membership base and ensuring that its needs are met.

#### **7.2.1.3 Actions to Discontinue**

Members are generally happy with the NCT systems, procedures, investments and the fact that it had remained a co-operative, and therefore for the moment, no changes in this regard are required.

In conclusion most of the recommendations relate to new methods required to give the co-operative an edge in the market place.



### **7.2.2 Greytown Specific Recommendations:**

#### **Focus is required in the following:**

- Investigations into backwards vertical integration to alleviate the labour, contractor and transport problems faced by members in this district. The feasibility of mechanised stump to mill operation controlled by the co-operative should be investigated.
- Educating members on the possible synergies and efficiencies that can exist between different crops as currently members in this area focus on other crops such as sugarcane and wattle and as a result their eucalyptus supplies are sometimes reduced.
- Selling the timber business to members. Encourage members who have planting permits and suitable areas to plant timber as opposed to converting to other crops.

### **7.2.3. Northern Natal Specific Recommendations:**

#### **Focus is required in the following:**

- Strategies that combat the effect of comparatively low pulpwood prices such as identifying, analysing and addressing inefficiencies in the NCT system allowing for a bigger margin before a price reduction has to be implemented and/or at the same time increasing the members profit margin making them less price sensitive. For example a central debarking unit that reduces the cost of harvesting from the members' side and introducing stump to mill contracts.
- A loyalty reward programme. This district is the most sensitive to price out of all the districts sampled. It is important to maintain supplies from this area by offering

rewards to those who supply in the good and the bad times. Further desired member behaviour is reinforced by rewarding it.

- Investigations into backwards vertical integration to alleviate the labour, contractor and transport problems faced by members in this district. The feasibility of mechanised stump to mill operation controlled by the co-operative should be investigated.

#### **7.2.4. Southern Natal Specific Recommendations:**

**Focus is required in the following:**

- Strategies that combat the effect of comparatively low pulpwood prices such as identifying, analysing and addressing inefficiencies in the NCT system allowing for a bigger margin before a price reduction has to be implemented and/or at the same time increasing the members profit margin making them less price sensitive. For example a central debarking unit that reduces the cost of harvesting from the members' side and introducing stump to mill contracts.
- A loyalty reward programme. This district is the second most price sensitive out of all the districts sampled. It is important to maintain supplies from this area by offering rewards to those who supply in the good and the bad times. Further desired member behaviour is reinforced by rewarding it.

### **7.2.5. Zululand Specific Recommendations:**

#### **Focus is required in the following:**

- Addressing the impact of other farming activities on supplies from this district as this is has the single biggest influence on volumes. An education programme focussing on the possible synergies between crops is suggested. Members in this area need to be made aware of their role in the supply chain and the effect that their actions have up and down the chain.

### **7.3 Further Research Suggested.**

From this study a number of areas for further research can be identified. Areas where cost improvement is possible need to be researched as timber suppliers are relatively price sensitive. Further to this synergies between other crops and eucalyptus and / or timber need to be analysed. What for instance would be the impact on transport and logistics if sugarcane and timber is combined on a farm, could efficiencies be maximised by doing this? Another area of research required is to identify whether timber areas have reduced significantly due to factors such as housing developments, land claims and labour problems.

In summary the constraints identified through the research need to be addressed in line with the principles of the TOC – therefore in such a manner that the overall performance is improved. The suggestions made in this chapter hope to do so. In every supply chain there will always be something that can be improved and every supply chain should always strive towards continual improvement. This study has touched on the broad issues that need addressing in order to enhance the supply of Eucalyptus pulpwood timber to NCT strategic markets in Kwa Zulu Natal.

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## Appendix A

# MBA RESEARCH QUESTIONNAIRE

Dear Member,

My name is Michelle Perry and I am at present a student at the University of Kwa Zulu-Natal and in the process of completing my MBA degree. One of the requirements of the degree is to write a dissertation on a business problem offering a recommended solution. As I am also employed by NCT Forestry Co-operative Limited in the capacity of District Manager – Southern Kwa Zulu-Natal, I have elected to write my dissertation on an NCT related topic.

The aim of this survey is to identify the current variables that influence the supply of Eucalyptus from NCT members to NCT strategic pulp markets. Understanding NCT's resource availability, not only in theory but in practice, and the factors that influence this resource is imperative in NCT achieving a balance between member resource and market demand, thus satisfying your marketing needs.

Please spare a couple of minutes of your time to complete and return the questionnaire below. **Your input is invaluable and will contribute to NCT achieving an important objective.**

Should you have any queries please contact me on (033) 897 8557 or by email: [michelle@nctforest.com](mailto:michelle@nctforest.com).

Any information supplied in this questionnaire will be confidential.

Please return the questionnaire in the enclosed prepaid envelope no later than **10 August 2005**

## QUESTIONNAIRE

<b>Name:</b>	Anonymous
<b>District:</b>	

Please indicate how the following statements affect your current **ACTUAL** and **PLANNED** supplies of eucalyptus pulpwood that you supply through NCT by marking the appropriate box with an X. Any comments providing further insight into why and how the statement affects your supplies will be appreciated.

NO	STATEMENTS	Almost Never	Seldom	Sometimes	Often	Almost Always	COMMENTS
1	Supplies to other agents or buyers initiated in the last 24 months reduce my NCT supply volumes.						
2	A R5 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.						
3	A R10 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.						
4	A R20 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.						
5	A lack of service from NCT reduces my supplies.						
6	My other farming activities reduce my timber supplies.						
7	Labour and/or contractor problems reduce my supplies.						
8	A lack of transport reduces my supplies.						



No	STATEMENTS	Almost Never	Seldom	Sometimes	Often	Almost Always	COMMENTS
9	The possible non-payment of commitment bonuses reduces my supply volumes.						
10	My supplies to other non-pulpwood markets e.g. pole markets and special markets reduce my pulpwood available to NCT.						
11	Recent investments made by NCT, in for example Durban Woodchips and Pulp United, has prompted me reduced my supplies to NCT.						
12	The fact that NCT as a co-operative has not converted to a company has prompted me to reduce my NCT supplies.						
13	NCT systems and procedures have prompted me to reduce my NCT supplies.						
14	At a mill delivered price of R230/ton I will stop/slow down harvesting and bank my timber						
15	At a mill delivered price of R250/ton I will stop/slow down harvesting and bank my timber						
16	At a mill delivered price of R270/ton I will stop/slow down harvesting and bank my timber						
17	At a mill delivered price of R290/ton I will stop/slow down harvesting and bank my timber						

**Thank you for your time and effort. Your input is highly valued.**

## Appendix B

### Summary of Answers (Count) – All Districts

No	STATEMENTS	Almost Never	Seldom	Sometimes	Often	Almost Always
1	Supplies to other agents or buyers initiated in the last 24 months reduce my NCT supply volumes.	34	5	7	1	1
2	A R5 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	35	3	5	3	2
3	A R10 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	26	4	8	5	5
4	A R20 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	18	5	5	8	12
5	A lack of service from NCT reduces my supplies.	29	13	4	1	1
6	My other farming activities reduce my timber supplies.	23	6	13	4	2
7	Labour and/or contractor problems reduce my supplies.	13	12	17	5	1
8	A lack of transport reduces my supplies.	21	11	14	2	
9	The possible non-payment of commitment bonuses reduces my supply volumes.	30	7	5	3	3
10	My supplies to other non-pulpwood markets e.g. pole markets and special markets reduce my pulpwood available to NCT.	18	6	11	6	7
11	Recent investments made by NCT, in for example Durban Woodchips and Pulp United, has prompted me reduced my supplies to NCT.	45	1	1	1	
12	The fact that NCT as a co-operative has not converted to a company has prompted me to reduce my NCT supplies.	47				1
13	NCT systems and procedures have prompted me to reduce my NCT supplies.	39	4	4	1	
14	At a mill delivered price of R230/ton I will stop/slow down harvesting and bank my timber	12	1	16	8	11
15	At a mill delivered price of R250/ton I will stop/slow down harvesting and bank my timber	16	7	15	8	2
16	At a mill delivered price of R270/ton I will stop/slow down harvesting and bank my timber	29	11	6	1	1
17	At a mill delivered price of R290/ton I will stop/slow down harvesting and bank my timber	39	8	1		

## Appendix C

### Summary of Answers (Percentage) –All Districts

	STATEMENTS	Almost Never	Seldom	Sometimes	Often	Almost Always
1	Supplies to other agents or buyers initiated in the last 24 months reduce my NCT supply volumes	71%	10%	15%	2%	2%
2	A R5 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	74%	6%	10%	6%	4%
3	A R10 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	55%	8%	17%	10%	10%
4	A R20 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	38%	10%	10%	17%	25%
5	A lack of service from NCT reduces my supplies.	61%	27%	8%	2%	2%
6	My other farming activities reduce my timber supplies.	48%	13%	27%	8%	4%
7	Labour and/or contractor problems reduce my supplies.	27%	25%	36%	10%	2%
8	A lack of transport reduces my supplies.	44%	23%	29%	4%	
9	The possible non-payment of commitment bonuses reduces my supply volumes.	63%	15%	10%	6%	6%
10	My supplies to other non-pulpwood markets e.g. pole markets and special markets reduce my pulpwood available to NCT.	38%	12%	23%	12%	15%
11	Recent investments made by NCT, in for example Durban Woodchips and Pulp United, has prompted me reduced my supplies to NCT.	94%	2%	2%	2%	
12	The fact that NCT as a co-operative has not converted to a company has prompted me to reduce my NCT supplies.	98%				2%
13	NCT systems and procedures have prompted me to reduce my NCT supplies.	82%	8%	8%	2%	
14	At a mill delivered price of R230/ton I will stop/slow down harvesting and bank my timber	25%	2%	33%	17%	23%
15	At a mill delivered price of R250/ton I will stop/slow down harvesting and bank my timber	33%	15%	31%	17%	4%
16	At a mill delivered price of R270/ton I will stop/slow down harvesting and bank my timber	60%	23%	13%	2%	2%
17	At a mill delivered price of R290/ton I will stop/slow down harvesting and bank my timber	81%	17%	2%		



## Appendix D

### Summary of Answers – Greytown District

STATEMENTS		Almost Never	Seldom	Sometimes	Often	Almost Always
1	Supplies to other agents or buyers initiated in the last 24 months reduce my NCT supply volumes.	100%				
2	A R5 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	100%				
3	A R10 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	100%				
4	A R20 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	50%	25%	25%		
5	A lack of service from NCT reduces my supplies.	100%				
6	My other farming activities reduce my timber supplies.	50%		25%		25%
7	Labour and/or contractor problems reduce my supplies.		50%	25%	25%	
8	A lack of transport reduces my supplies.	25%	25%	50%		
9	The possible non-payment of commitment bonuses reduces my supply volumes.	75%	25%			
10	My supplies to other non-pulpwood markets e.g. pole markets and special markets reduce my pulpwood available to NCT.	50%		25%		25%
11	Recent investments made by NCT, in for example Durban Woodchips and Pulp United, has prompted me reduced my supplies to NCT.	100%				
12	The fact that NCT as a co-operative has not converted to a company has prompted me to reduce my NCT supplies.	100%				
13	NCT systems and procedures have prompted me to reduce my NCT supplies.	100%				
14	At a mill delivered price of R230/ton I will stop/slow down harvesting and bank my timber.	50%		50%		
15	At a mill delivered price of R250/ton I will stop/slow down harvesting and bank my timber	75%	25%			
16	At a mill delivered price of R270/ton I will stop/slow down harvesting and bank my timber.	100%				
17	At a mill delivered price of R290/ton I will stop/slow down harvesting and bank my timber.	100%				

## Appendix E

### Summary of Answers – Northern Natal District

	STATEMENTS	Almost Never	Seldom	Sometimes	Often	Almost Always
1	Supplies to other agents or buyers initiated in the last 24 months reduce my NCT supply volumes	73%		20%		7%
2	A R5 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	60%	7%	13%	13%	7%
3	A R10 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	40%	13%	20%	20%	7%
4	A R20 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	33%	7%	7%	20%	33%
5	A lack of service from NCT reduces my supplies.	53%	27%	13%		7%
6	My other farming activities reduce my timber supplies.	47%	20%	33%		
7	Labour and/or contractor problems reduce my supplies.	33%	20%	33%	7%	7%
8	A lack of transport reduces my supplies.	54%	13%	33%		
9	The possible non-payment of commitment bonuses reduces my supply volumes.	53%	13%	7%	20%	7%
10	My supplies to other non-pulpwood markets e.g. pole markets and special markets reduce my pulpwood available to NCT.	47%	20%	13%	13%	7%
11	Recent investments made by NCT, in for example Durban Woodchips and Pulp United, has prompted me reduced my supplies to NCT.	86%	7%	7%		
12	The fact that NCT as a co-operative has not converted to a company has prompted me to reduce my NCT supplies.	93%				7%
13	NCT systems and procedures have prompted me to reduce my NCT supplies.	80%	13%	7%		
14	At a mill delivered price of R230/ton I will stop/slow down harvesting and bank my timber	13%		33%	21%	33%
15	At a mill delivered price of R250/ton I will stop/slow down harvesting and bank my timber	13%		60%	27%	
16	At a mill delivered price of R270/ton I will stop/slow down harvesting and bank my timber	40%	40%	20%		
17	At a mill delivered price of R290/ton I will stop/slow down harvesting and bank my timber	67%	33%			

## Appendix F

### Summary of Answers – Southern Natal District

STATEMENTS		Almost Never	Seldom	Sometimes	Often	Almost Always
1	Supplies to other agents or buyers initiated in the last 24 months reduce my NCT supply volumes	64%	16%	16%	4%	
2	A R5 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	72%	8%	12%	4%	4%
3	A R10 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	56%	4%	20%	4%	16%
4	A R20 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	36%	12%	8%	20%	24%
5	A lack of service from NCT reduces my supplies.	60%	28%	8%	4%	
6	My other farming activities reduce my timber supplies.	52%	12%	20%	16%	
7	Labour and/or contractor problems reduce my supplies.	28%	24%	36%	12%	
8	A lack of transport reduces my supplies.	40%	28%	28%	4%	
9	The possible non-payment of commitment bonuses reduces my supply volumes.	68%	8%	16%		8%
10	My supplies to other non-pulpwood markets e.g. pole markets and special markets reduce my pulpwood available to NCT.	28%	8%	28%	20%	16%
11	Recent investments made by NCT, in for example Durban Woodchips and Pulp United, has prompted me reduced my supplies to NCT.	96%			4%	
12	The fact that NCT as a co-operative has not converted to a company has prompted me to reduce my NCT supplies.	100%				
13	NCT systems and procedures have prompted me to reduce my NCT supplies.	72%	12%	12%	4%	
14	At a mill delivered price of R230/ton I will stop/slow down harvesting and bank my timber	24%	4%	32%	16%	24%
15	At a mill delivered price of R250/ton I will stop/slow down harvesting and bank my timber	32%	20%	24%	16%	8%
16	At a mill delivered price of R270/ton I will stop/slow down harvesting and bank my timber	60%	24%	8%	4%	4%
17	At a mill delivered price of R290/ton I will stop/slow down harvesting and bank my timber	84%	16%			



## Appendix G

### Summary of Answers – Zululand District

	STATEMENTS	Almost Never	Seldom	Sometimes	Often	Almost Always
1	Supplies to other agents or buyers initiated in the last 24 months reduce my NCT supply volumes	75%	25%			
2	A R5 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	100%				
3	A R10 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	50%	25%		25%	
4	A R20 decrease relative to alternative buyers in the price that NCT pays for eucalyptus pulpwood will reduce my NCT supplies.	50%		25%		25%
5	A lack of service from NCT reduces my supplies.	50%	50%			
6	My other farming activities reduce my timber supplies.	25%		50%		25%
7	Labour and/or contractor problems reduce my supplies.	25%	25%	50%		
8	A lack of transport reduces my supplies.	50%	25%	25%		
9	The possible non-payment of commitment bonuses reduces my supply volumes.	50%	50%			
10	My supplies to other non-pulpwood markets e.g. pole markets and special markets reduce my pulpwood available to NCT.	75%		25%		
11	Recent investments made by NCT, in for example Durban Woodchips and Pulp United, has prompted me reduced my supplies to NCT.	100%				
12	The fact that NCT as a co-operative has not converted to a company has prompted me to reduce my NCT supplies.	100%				
13	NCT systems and procedures have prompted me to reduce my NCT supplies.	100%				
14	At a mill delivered price of R230/ton I will stop/slow down harvesting and bank my timber	50%		25%	25%	
15	At a mill delivered price of R250/ton I will stop/slow down harvesting and bank my timber	75%	25%			
16	At a mill delivered price of R270/ton I will stop/slow down harvesting and bank my timber	100%				
17	At a mill delivered price of R290/ton I will stop/slow down harvesting and bank my timber	100%				